Aalto University
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LEARNING DIGITALIZATION WITH CUSTOMERS

A multiple case study in Finnish manufacturing companies

Master's Thesis
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Abstract of master's thesis

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Abstract

The objective of the research was to understand the factors that affect the presence of customers in digitalization-related organizational learning of manufacturing companies. Three large Finnish manufacturing companies and their digitalization efforts constituted the research context for the comparative case study.

The research followed abductive qualitative methodology, combining inductive qualitative analysis of the interview data with the findings from academic literature. The theoretical framework was a combination of organizational learning theory and lead user innovation theory.

My findings suggest that the presence of customers in digitalization-related organizational learning of manufacturing companies is affected by the manufacturers' learning orientation towards digitalization and by the criticality of their equipment in customer operations. On one side, learning orientation supports organizational learning through shared vision on the role of digitalization in the company strategy, commitment to learning about digitalization, open-mindedness to challenge their traditional ways of doing things to enable digitalization, and intra-organizational knowledge sharing needed for digitalization projects that are cross-functional by nature. Learning orientation in the context of digitalization supports customer orientation of the company through ensuring that 1) customer value drives digitalization-related development projects in the company, 2) customers are involved into the development projects, 3) customer equipment data can be accessed. On the other side, the criticality of the manufacturer' equipment in the customer's operations define customer's eagerness to be involved into digitalization efforts of the company. "Process-critical" customers, as the lead users who are more likely to benefit from digitally enhanced solutions and who are more eager to provide access to their equipment data and collaborate in solution development, are a valuable source of knowledge for manufacturing companies and facilitate their learning and competence development.

While manufacturing companies are able to take actions to enhance their learning orientation, the differences in the criticality of their equipment in customer operations can unequally position them to go through organizational learning and develop digital competences. In this way, manufacturing companies can be unequally positioned to create the essential foundation for innovating and grasping the potential benefits of digitalization.

Keywords digitalization, organizational learning, learning orientation, lead user innovation

PREFACE

I know hardly any person who enjoyed writing their thesis. Nevertheless, this is the struggle that each of us eventually remembers with a smile. What makes a struggle a little bit easier is guidance. I am indefinitely thankful to my supervisor for the patience he demonstrated during the process and for all the help that he provided me with when I needed it.

I am very grateful to my family and to my friends for believing in me, for supporting me during the rough times and for sharing the happiest moments throughout my studies. I am unbelievably lucky to have you!

Finally, I want to thank Aalto University and all the amazing people I met during this exciting journey, who inspired me, who led me by their example, who made me a much better version of myself. Thank you and cheers!

Alina Baykova

Helsinki, September 2017.

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1 Introduction

My Master's thesis journey started in January 2015. Back then, together with the research group of four people, I dedicated my time to the attempts to understand better, how Finnish manufacturing companies organize for digitalization. The gradual adoption of digital technologies by manufacturing companies has been taking place for more than fifty years now. Having started in 1960s with the introduction of automation in certain parts of value chain, the digital technology evolution has moved towards closer integration between the processes due to increased possibilities of leveraging connectivity. From the beginning of 2000s the digital technology evolution has been moving further towards embedded interconnectedness between people, equipment, processes, providing companies with new information flows and, as a result, massive amount of new data (Porter & Heppelmann, 2014). The rapid changes in technologies will clearly leave no company immune to digitalization.

Digitalization is expected to radically change the way companies operate and innovate. The potential benefits of it are threefold. Firstly, the opportunity to integrate and better manage horizontal and vertical value chains gives a promise for higher productivity rate. Secondly, the interconnection of products and services at the core of digitalization can potentially create additional revenues. Thirdly, new customer value creation becomes possible through new emerging business models that are based on increased horizontal cooperation across value chains.(Koch, Kuge, Geissbauer, & Schrauf, 2014)

However, in the scope of the TEKES-funded research project "Organizing for digitalization", we did not focus on the potential benefits of digitalization that manufacturing companies could achieve. Instead, the goal was to understand how companies organize for digitalization, what kind of initiatives related to utilization of digital technologies were implemented by them and how, and what kind of new skills and competences were required for successful implementation of those initiatives. The areas of interest were related to spotting major challenges that companies face on their digitalization way and to understanding the ways that companies tackle the challenges that they face. We sought for the answers to the posed questions through a multiple case study of three Finnish manufacturing companies.

From the early stages of the research, it became clear that in order to get to the stage of potential benefit realization, companies had a long way to go. Despite the relatively easy accessibility of new technologies for many companies, they differ in their ability to transform and fully adopt the technologies, utilize the new information and, eventually, grasp the benefits

brought up by digitalization. Low perceived customer value of digital products and services as well as unclear economic benefits along with prohibitively high investments into required organizational transformation are seen as the biggest challenges on the way of developing and implementing digital solutions. (Koch et al., 2014)

1.1 Research background

Based on the initial interviews with the case companies it became clear that behind the promised benefits coming from digitalization in terms of improved efficiency, customer relationships, extended offering, etc., stand not only considerable investments into digitizing the vast preinstalled base of manufactured products. Given the financial capability of the companies to "afford" digitalization, the potential benefits gained from it and the ability to innovate, that could be defined by the organizational capability to develop needed market and technological competences, to learn and change, might vary a lot between companies.

According to Drejer (2000, p. 207) core competences are defined as means to offer superior value to customers. While core competences of a firm are universally agreed to be a key to its competitive advantage, organizational learning theory is a key to understanding competence development (Drejer, 2000). A multitude of studies is dedicated to the role of organizational learning in strategic renewal and organizational change (Crossan & Bedrow, 2003; Crossan, Lane, & White, 1999; Cross & Israelit, 2009), achieving superior performance (Battor & Battour, 2013; Drejer, 2000), particularly by facilitating innovation (Alegre & Chiva, 2008; Calantone, Cavusgil, & Zhao, 2002; Jiménez-Jiménez & Sanz-Valle, 2011) or innovativeness (Hult, Hurley, & Knight, 2004) through stronger learning orientation and culture (Alegre & Chiva, 2008; Calantone et al., 2002; Goh, Elliott, & Quon, 2012; Tran, 2008).

Organizational learning can be described as a set of learning processes (Ahmed & Wang, 2003; Huber, 1991; Slater & Narver, 1995) or as a result of the learning processes transformed into organizational knowledge (Ahmed & Wang, 2003; Cross & Israelit, 2009; Lichtenthaler, 2009). The learning processes can lead to either generative or adaptive learning that differently contribute to organizations' innovative activities (Huber, 1991; Raisch & Birkinshaw, 2008; Slater & Narver, 1995). Companies' ability to gain desired benefits is based on their capabilities to leverage their technological and market knowledge in their learning processes (Lichtenthaler, 2009). Proactive learning about clients, competition and environment fosters market-oriented behaviors and can lead a learning organization towards higher levels of market orientation (McGuinness & Morgan, 2005; Santos-Vijande, Sanzo-Pérez, Álvarez-González, & Vázquez-

Casielles, 2005). Learning orientation helps organizations gain superior understanding of customer evolving needs and develop appropriate responses to them (Battor & Battour, 2013). On top of that, it supports continuity and proximity of customer relationships (Battor & Battour, 2013; Raj & Srivastava, 2016).

Research shows that different approaches to marketing have different effect on the learning style that organizations adopt (Chaston, Badger, & Sadler-Smith, 2000). As relationship marketing is often seen as means to firm's survival in turbulent markets, companies that manage to learn new ways of working closely with customer, eventually manage to differentiate themselves from competition (Chaston et al., 2000). While the range of drivers of organizational learning includes, for example, senior management support for developing necessary infrastructure, promoting learning culture and need for change (Aragón-Correa, García-Morales, & Cordón-Pozo, 2007; McGuinness & Morgan, 2005; Yeung, Lai, & Yee, 2007), firm's competitive strategy (Yeung et al., 2007) and pursued business model (Hu, 2014), assumptions about and relationship with internal and external environment (Tran, 2008), there is a gap in understanding the role of customers in organizational learning.

Previous research also shows various impact that customers can have on firms' innovation process. According to Christensen and Bower (1996), customer orientation can lock companies on their current core customers and limit their innovativeness towards satisfying their needs. As a result, it jeopardizes firms' competitiveness in the context of radical technological change. However, at the same time, strong impetus from customers can support acquiring new technological competences that firms need to combine with their customer competences for successful innovation (Christensen & Bower, 1996).

Lead user innovation theory underlines the importance of involving a particular group of customers - lead users - into market research for novel products (von Hippel, 1978). Lead users, as a group of users with strong current needs about something that will become general in a market place and with strong potential benefits coming from fulfilling these needs, can provide valuable insights for developing new products and services (Matthing, Per Kristensson, Anders Gustafsson, & A. Parasuraman, 2006; Slater & Narver, 1998a; von Hippel, 1986).

Given the fact that digitalization brings up new context for manufacturing companies that they need to adjust to, understanding the role of organizational learning in this transformation and its drivers is essential. With this research, bearing in mind the critical role of customers and customer orientation in firms' innovation process, I attempt to understand how customers are present in digitalization-related organizational learning and what factors influence their

presence. For this purpose, I explore organizational learning and lead user innovation theories in more detail, using these two areas of research as a lens for the multiple case study.

1.2 Research problem and questions

The potential benefits of organizational learning can be achieved as a result of appropriate use of organizational knowledge. Meanwhile, organizational knowledge is the result of organizational learning processes (Martínez-León & Martínez-García, 2011). Thus, in order to achieve desired benefits, organizational learning needs to be in place and generate needed organizational knowledge and competences – both technological and market. The initial interviews with the case companies provided a hint that customers seemed to play an important role in how organizations learn to become a part of digitalization phenomenon.

Thus, the research question is posed as follows:

- What factors influence the presence of customers in manufacturing companies' organizational learning related to digitalization ?

The further objective of the Master's thesis is to provide empirical understanding about organizational learning in manufacturing firms in the context of digitalization and customers' role in it. With my thesis, I try to illustrate digitalization-related organizational learning at some leading manufacturing companies in Finland. Comparing findings on what enables digitalization-related learning for the companies with the similar heritage of a traditional manufacturing company can provide an opportunity to generalize them into recommended industry practices. The broad definition of digitalization leaves space for an equally broad range of potential applications.

1.3 Structure of the study

This report consists of a literature review, methodology section, findings, discussion and conclusions of the research. In chapter 2, I review the necessary literature to provide the theoretical background of organizational learning and customer role in it. In chapter 3, I present the research methodology and describe the data collection and processing. Chapter 4 outlines the key research findings. Chapter 5 discusses the findings and compares them with earlier research, as well as suggests some practical implications. Finally, in chapter 6, I conclude the study and evaluate its limitations, providing ideas for future research.

2 Literature review

This chapter provides theoretical background for the research. I start with introducing different aspects of organizational learning and its importance for organizational change, innovation and performance. I further elaborate on the role of customer in organizational learning, using the insights from lead user innovation theory.

2.1 Organizational learning

2.1.1 Organizational learning as an enabler for strategic renewal

Something is considered strategic if it has an impact on a company's long-term success. However, since companies cannot predict with certainty what factors are expected to affect their future success, factors that have a potential to affect their long-terms success can be considered strategic (Agarwal & Helfat, 2009). Having a definition of what can be considered "strategic", it is important to draw the difference between renewal and change as the terms are often used interchangeably. Change might refer to extensions, additions or deletions of certain organizational attributes. Renewal, however, is a particular type of change that implies refreshment or replacement of strategic attributes (Agarwal & Helfat, 2009). In other words, strategic renewal is a form of organizational change that implies replacement or refreshment of organizational attributes that have a potential to have an impact on a firm's long-term success.

Strategic renewal can be defined through its process, content and outcome (Agarwal & Helfat, 2009). Crossan el al., (1999, p. 522) refer to organizational learning as "principal means of achieving the strategic renewal of an enterprise". Thus, one can see organizational learning as a key construct related to strategic renewal process, as it helps understand how strategic renewal is implemented. Their research introduces four core processes of organizational learning – intuiting, interpreting, integrating and institutionalizing – that happen on three different levels. Intuiting and interpreting happen on individual level, interpreting and integrating on group level, and integrating and institutionalizing on organizational level (Crossan et al., 1999). The multi-level nature of organizational learning corresponds to the multidimensional nature of organizational change happening in organizational structure, technological base, business model, capabilities, organizational mindset, etc. The level of the impact that the change (its content, process, and outcome) has on a company's strategy and organization defines two types of strategic renewal - strategic transformation and incremental renewal. (Agarwal & Helfat, 2009)

McGuinnes and Morgan (2005) consider incessant organizational change an essential element in describing dynamic nature of strategy. The effectiveness of strategy implementation can be described through the construct of organizational change capability that includes three components – a suitable foundation for incessant change, the ability to shape it, and sustaining its energy. A suitable foundation for change refers to shared organization-wide agreement on the need for change. The best way to achieve is by the leadership from senior management. The ability to shape incessant change depends upon organizational structures, systems and processes. The role of culture then is to focus structures, systems and processes on consistently following the intended type of strategy dynamics. Sustaining the energy of change relates to sustaining employees' commitment to formulate and implement change initiatives. Organizational change capability in the presence of learning orientation ensures effective implementation of the changes caused by organizational learning (McGuinness & Morgan, 2005). Meanwhile, organizational learning can be seen as "a capacity or processes within an organization to maintain or improve performance based on experience" (Cross & Israelit, 2009, p. 120). The knowledge base, enhanced through experiences, ultimately allows for the development of competencies and incremental or transformational change (Cross and Israelit, 2009).

Similarly to organizational change capability being a prerequisite for organizational change (McGuinness & Morgan, 2005), organizational learning capability can be considered a foundation for organizational learning (Alegre & Chiva, 2008). Organizational learning capability describes management practices, mechanisms and structures that can be implemented in an organization to promote learning (Goh et al., 2012). Alegre & Chiva (2008) define organizational learning capability as "a bundle of tangible and intangible resources or skills the firm uses to achieve new forms of competitive advantage" (Alegre & Chiva, 2008, p. 315), and the combination of these skills enables the process of organizational learning. The multidimensional nature of organizational learning capability can be described through several facilitating factors - experimentation, risk taking, interaction with the external environment, dialogue, and participative decision making (Chiva, Joaquin Alegre, & Rafael Lapiedra, 2007). The dimensions take into consideration various theoretical perspectives on how organizational learning construct can be measured.

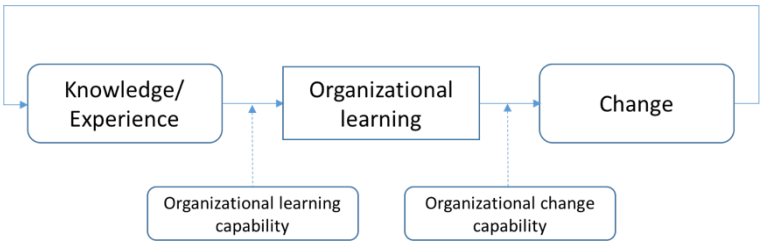

Figure 1. Illustration of the relationship between knowledge, organizational learning, change, organizational learning capability and organizational change capability.

To summarize, strategic renewal is a particular type of organizational change that implies transformation of certain organizational attributes. These attributes have a potential to impact firm's long-term success. Organizational change has a multidimensional nature and can be characterized by its content, process and outcome. Organizational change capability ensures effective implementation of changes caused by organizational learning. Organizational learning can also be seen as a process for achieving organizational change. Organizational learning capability, in its turn, enables organizational learning process based on accumulated knowledge (Figure 1). In the next chapters, considering their key role in driving effective organizational change, organizational learning process and organizational learning capability are elaborated in more detail.

2.1.2 Organizational learning orientation

Learning orientation defines organizational predisposition to learn and is based on three core values (Grant, 1996; Sinkula, Baker, & Noordewier, 1997). First, commitment to learning is associated with the probability of promoting learning culture in the organization. Second, shared vision coordinates the focus of learning and the goals that the organization is trying to achieve with it. One of the biggest challenges that organizations face is achieving a coordinated and cooperation-based action from the individuals inside the organization. Therefore, shared vision could be a driving force for coordinated learning effort inside an organization (Grant, 1996). Third, open mindedness is associated with organization's willingness to challenge the assumptions about cause-effect relationships (Battor & Battour, 2013; Grant, 1996).

Together with the above-mentioned Calantone et al. (2002) consider a fourth construct of learning orientation – intra-organizational knowledge sharing – that relates to collective beliefs and behavioral routines associated with distribution of learning within the organization.

It is based not only on gathering knowledge from various sources but also on systematic re-examination and on restructuring of information to support further actions.

Learning orientation seems to correspond to the concept of learning capability that was introduced earlier. Learning capability refers to management practices, mechanisms and structures that can be implemented in an organization to promote learning (Goh et al., 2012). Meanwhile, cultural perspective on the organizational learning suggests that culture is a sense-making mechanism that helps organizations to create the structure that facilitates interpretation of unfamiliar events. Learning culture can be seen as a metaphor that guides individual and collective learning and enables organizations to utilize their knowledge and experiences in order to establish and achieve desired goals (Ahmed & Wang, 2003).

Different levels of learning orientation lead to different activities that companies can and are willing to exercise to achieve desired performance outcomes. As discussed earlier, learning culture can be seen as a one of the dimensions of learning orientation. Meanwhile, it is possible to differentiate between three types of learning culture – reflexive, bounded and critical – in relation to innovation activities that companies perform (Tran, 2008). Reflexive organizational learning culture is based on the assumption that cause-affect connections about a company performance, its environment, and relationships that compose its context are not relevant for the organizational survival and growth. Due to the lack of the pressure that is normally provided by the above-mentioned cause-affect connections, such organizations are not incentivized to develop more advanced learning culture to improve performance. Bounded, or adaptive, learning nourishes a culture where creative activities are limited to incremental innovation that focuses on enhancing existing knowledge and capabilities in order to better serve the needs of existing customers. Critical learners are eager to question their assumptions regarding cause-affect relationships and distinguish between concepts that are still applicable in the changing environment and the ones that need to be abandoned. Their innovation activities are driven by their evolving understanding of the context in which they operate. Together with the ability to develop their knowledge and capabilities according to the changing environment, it makes them better equipped for more radical innovations. (Tran, 2008)

Learning is a dynamic process that is strongly affected by environmental factors such as customer demand uncertainty, technological turbulence and market uncertainty (Calantone et al., 2002). The perception of external threat can boost organizational learning activities and push the organization to more advanced level of learning culture (Tran, 2008). A learning oriented organization, or, following Tran's approach, an organization that shows a more advanced level of learning culture, can be more likely to innovate more effectively and build and market

technological breakthroughs as it is more likely to be committed to innovation, have state-of-the-art technology and apply that technology in its innovation activities (Calantone et al., 2002; Tran, 2008). In other words, higher learning orientation is likely to lead to more effective organizational learning process, particularly to better market information acquisition and dissemination (Sinkula et al., 1997). The illustration of the relationship between organizational learning, learning orientation, learning culture and innovation that was build based on the literature summarized in this section, is shown in Figure 2.

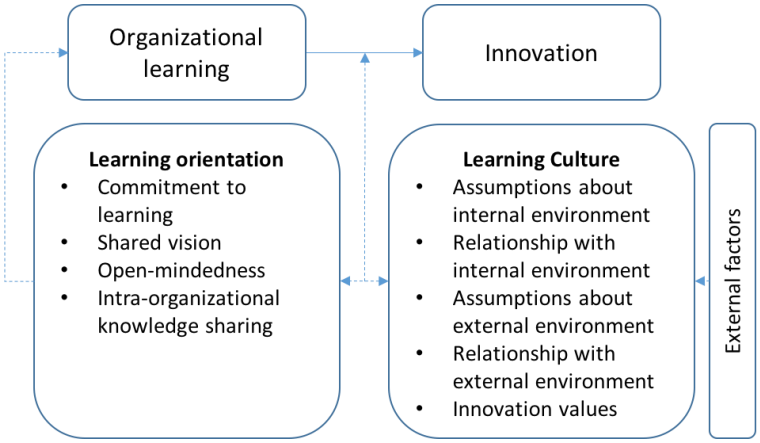

Figure 2. Illustration of the relationship between organizational learning, learning orientation, learning culture and innovation.

2.1.3 Organizational learning process

Organizational learning can be described as a set of processes of a learning system, through which organizations understand and manage their experiences. The four main components of learning process are knowledge acquisition, information distribution, information interpretation and organizational memory (Ahmed & Wang, 2003; Slater & Narver, 1995).

Information acquisition can be based on the internal organizational experience or on the experience of others as well as come from the organizational memory (Slater & Narver, 1995). Huber (1991, p.88) suggests that knowledge acquisition can be viewed through five sub-processes: (1) drawing on knowledge available at the organization's birth, (2) learning from experience, (3) learning by observing other organizations, (4) grafting on to itself components that possess knowledge needed but not possessed by the organization, and (5) noticing or searching for the information about the organization's environment and performance. Drawing

upon knowledge existing at the company's birth, or congenital learning, is based on the combination of knowledge inherited from its founders and learning developed through a short period from its conception to its formal incorporation. Learning from experience, or experimental learning, relates to knowledge acquisition through organizational direct experience. Organizational learning in this case can be both the result of intentional and systematic or unintentional and unsystematic effort. Knowledge can also be acquired as a result of indirect, second-hand learning. For example, learning process can be based on observing strategies, practices or technologies of other organizations. Another way to gain new knowledge that organizations do not possess is to attract new people into the organization that already possess this knowledge, that can be referred to as "grafting". (Huber, 1991, p. 97)

As another form of knowledge acquisition, search can be categorized into three forms: scanning ("wide-range sensing of organizational learning environment" (Huber, 1991, p. 97)), focused search (search in a narrow segment of internal or external environment as a reaction to a threat or an opportunity), and performance monitoring (sensing the fulfillment of pre-established organizational goals or requirements of stakeholders). Along with intended search, organizations can acquire knowledge about external environment and own performance through noticing (unintended acquisition of information). (Huber, 1991)

Information distribution, or dissemination, refers to the flow of information between organizational functions (Huber, 1991; Slater & Narver, 1995). Effective information dissemination ensures a shared interpretation of the information by different stakeholders in a bigger context of organizational activities. It eventually provides an opportunity for better decision making that takes into consideration feedback from different stakeholders and is based on more real-time information sharing between different organizational functions (Slater & Narver, 1995). As a last stage of organizational learning, a firm needs to have a consensus on the meaning of the information and its implications to business based on shared information interpretation. The role of the organization in this case is to provide means for effective information exchange and discussion. (Slater & Narver, 1995)

Organizational memory refers to the systems, procedures and organizational routines that need to be in place to ensure long knowledge lifecycle (Slater & Narver, 1995). However, organizational memory can also become a constraint for organizational learning if it is not balanced by organizational unlearning. Organizational unlearning is needed to keep the systems and routines based on relevant underlying assumptions about the environment in which a firm operates (Huber, 1991). Organizational memory, as a key to organizational learning and decision-making, is closely linked to other processes – knowledge acquisition, information

distribution (how knowledge demand and knowledge supply between organization units is organized efficiently and effectively) and information interpretation. Usability and demonstrability of organizational learning depends on how organizational memory is set and how efficiently and effectively the consolidated knowledge can be applied for knowledge acquisition, distribution and interpretation (Huber, 1991).

Based on the configuration of the components of organizational learning process, two types of organizational learning systems can be defined – open and closed. Open systems, as opposed to closed ones where learning is restricted within one organization, take into account situational factors and inter-organizational learning as an important part of the whole organizational learning system. (Ahmed & Wang, 2003). Therefore, for example, the externally focused sub-processes of information acquisition introduced by Huber (1991), such as learning by observing other organizations, grafting on to itself the components that possess the needed knowledge, and noticing or searching for the information about organization's environment and performance, should be present only in open learning systems. Similarly, it is fair to say that information distribution in open learning systems is not limited by organizational boundaries letting information flow not only cross-functionally inside a firm but also across organizations.

Organizational memory, as one of the constructs of organizational learning, can also be elaborated through knowledge management perspective on organizational learning. According to the knowledge management perspective, organizational learning can be seen as a change in the state of knowledge where learning is a process of accumulating and creating knowledge base (Ahmed & Wang, 2003). The configuration of the elaborated components of organizational learning process can lead to different levels of change in organizational learning base. Generally, the two types of organizational learning can be referred to as adaptive or generative learning (Slater & Narver, 1995). Adaptive learning reflects a single loop learning that happens under the constraints of dominant general management logic. It usually has incremental nature and is limited to the traditional scope of a firm's activities. On the contrary, generative learning is "frame-breaking", requires challenging assumptions about interrelations between key issues and events and aims to develop new ways of working (Slater & Narver, 1995).

Building upon the definition of the types of learning systems and the types of organizational learning, certain relationships can be stated (Huber, 1991). Exploration and exploitation as concepts can be linked to the types of organization learning – generative and adaptive respectively (Raisch & Birkinshaw, 2008). Exploration leads to generative learning as a result of externally-focused organizational learning process. However, too much reliance on it can be too expensive for a firm and lead to underdeveloped concepts and lack of leverage of

organizational core competences. Meanwhile, exploitation as an internally focused organizational learning process leads to adaptive learning. Too much reliance on exploitation can turn "core competences" into "core rigidities" and inhibit innovation in a firm (Huber, 1991).

To summarize, organizational learning is a dynamic process that includes several components related to acquisition, interpretation and distribution of knowledge. The configuration of learning process components defines open or closed organizational learning systems. Open learning systems, that imply externally focused organizational learning process, are more likely to lead to generative learning that aims to develop new ways of working. Meanwhile, closed learning systems are likely to generate adaptive learning that has incremental character and is normally limited to the traditional scope of a firm's activities. Therefore, it is fair to say that facilitating externally focused organizational learning processes can lead to more effective generative learning.

2.1.4 Organizational learning in innovation and firm performance

While core competences of a firm are universally agreed to be a key to its competitive advantage, organizational learning theory is a key to understanding competence development (Drejer, 2000). According to Drejer (2000, p. 207) core competences are defined to offer superior value to customers. Organizational learning leads to better company performance as it helps to develop competences for understanding and efficiently satisfying customer expressed and latent needs (Battor & Battour, 2013).

Previous research shows that organizational learning influences organizational performance mainly by facilitating innovation (Jiménez-Jiménez & Sanz-Valle, 2011). Goh et al. (2012) use the concept of "learning capability" to describe management practices, mechanisms and structures that can be implemented in an organization to promote learning. Organizational learning capability can be a source of competitive advantage as it is deeply embedded in organizational processes and difficult to imitate. In the long run, organizations that develop superior learning capabilities can achieve superior performance (Battor & Battour, 2013). Particularly, developing learning capability can improve such non-financial measures of organizational performance as innovation (Alegre & Chiva, 2008; Goh et al., 2012).

A learning-oriented organization is more likely to innovate more effectively and build and market technological breakthroughs as it is more likely to be committed to innovation, have

state-of-the-art technology and apply that technology in its innovations activities (Calantone et al., 2002; Tran, 2008). Moreover, as learning-oriented organizations are able to question their operating models and to foresee and adjust to the environmental and market changes, learning can cause behavior change in organizations that enhances performance. This provides a practical support for management to build a business case to invest into developing learning capabilities (Battor & Battour, 2013).

One of the key success factors for industrial firms is their ability to introduce new processes, products and ideas in the organization, that can be defined as their ability to engage in innovation, or innovativeness (Hult et al., 2004). While the innovation is generally agreed to lead to better performance of companies, Hult et al. (2004) suggest that innovativeness also has a positive impact on firm's performance. Their research shows that the learning orientation, along with other two variables– market orientation and entrepreneurial orientation – enhances a firm's innovativeness. Thus, when a firm enhances its learning orientation, it enhances it capability to innovate. However, a firm's innovativeness is a strong mediator between its learning orientation and business performance. Learning orientation contributes to achieving performance objective of an industrial firm only when it strengthens its innovativeness.

According to Tran (2008), some firms are better innovators than others because of their learning cultures. Particularly, the type of innovation that organization is able to produce depends on its learning culture and its perception of external threat. One of the key underlying assumptions is that involvement into a learning process is not enough for a firm to innovate. What makes a difference and what makes a certain company a better innovator than others is the result of the learning process, thus, what it has learned. Organizational learning culture defines its ability to learn, and, eventually, has an impact of innovative program that a company adopts (Tran, 2008).

Although firm's innovation activities are widely accepted to be a way to improve its performance, many companies do not manage to follow them. On one side, individual leadership style is seen as one of the key factors influencing a firm's innovation as leaders inspire for innovation in the organizations and set goals for their subordinates. They also make decisions regarding which new ideas are to be introduced in the organization. On the other side, the collective capability of organizational learning also tends to have a key influence on firm's innovation (Aragón-Correa et al., 2007). Yeung et al. (2007) also provide empirical evidence that the support of senior management is critical for organizational learning. The necessary infrastructure and organizational culture that foster organizational learning are developed only when senior management sees the value of organizational learning and promotes it.

Even though the importance of organizational learning as a source of competitive advantage and the impact of organizational learning on a firm's performance is widely accepted, the link between organizational learning and a firm's competitive strategy is often missing (Yeung et al., 2007). As discussed earlier, the role of leadership and management is critical for facilitating organizational learning. While a firm's competitive strategy can be considered as an outcome of managerial choices, it is also important to understand the impact of these choices on organizational learning. Previous research shows that a firm's competitive strategy and its level of technology affects the impact that organizational learning has on business performance (Yeung et al., 2007). For organizations adopting differentiation strategy with strong focus on innovation, quality and service capabilities, strong learning orientation becomes critical for achieving and sustaining competitive advantage and maximize performance. Meanwhile, for organizations adopting cost-leadership strategy, strong learning orientation is not in line with their goal of minimizing the cost of their existing resources to maximize their performance. The cost of additional effort required from organization to foster innovation leads to diminishing the effects of organizational learning. (Yeung et al., 2007)

To summarize, organizational learning is critical for achieving superior performance as it enables developing the necessary competences for understanding and fulfilling customer needs. Organizational learning capability is a competence that facilitates innovative activities in an organization and can be a source of competitive advantage. It corresponds to the notions of learning orientation and learning culture as all three constructs refer to how learning is promoted in a company and how it impacts organizational performance through facilitating innovation. Organizational learning, however, is shaped by a firm's competitive strategy. Developing learning capability is important for organizations that adopt differentiation competitive strategy with a strong focus on innovation. Previous research also acknowledges the role of leadership and top management in defining competitive strategy and in promoting learning and innovation.

2.2 Customer presence in organizational learning

2.2.1 Organizational learning and market orientation

It is widely discussed in the previous research whether market orientation is an antecedent or consequence of organizational learning (Raj & Srivastava, 2016; Santos-Vijande et al., 2005). On one side, proactive learning about clients, competition and environment can lead a learning organization towards higher levels of market orientation (Santos-Vijande et al., 2005). Learning

orientation fosters market-orientated behaviors (intelligence acquisition, dissimilation and use) to be used for generative learning focused on new better ways of doing things or new ways of doing better things instead of adaptive learning where the focus is on incremental improvements (McGuinness & Morgan, 2005). On the other side, a company with behavior patterns aligned with strong values of market orientation can become a learning organization. Santos-Vijande et al. (2005) suggest that learning orientation, as a firm's willingness to generate organizational learning and, thus, an indirect estimate of organizational learning can stimulate learning oriented behavior while market-oriented organizations can develop generative learning. Thus, there is a mutual dependency between market orientation and organizational learning (Santos-Vijande et al., 2005).

The knowledge and ability to understand and anticipate customer needs make it unlikely for a learning-oriented organization to miss emerging market demand opportunities (Calantone et al., 2002). Learning-oriented companies are also able to develop superior knowledge about customers' evolving needs, and, thus, are able to develop appropriate responses to those (Battor & Battour, 2013). Sharing created customer knowledge facilitates coordinated effort from different departments in a company and allows responding to any needs in a contextual manner. This eventually helps to build closer relationships with the customers. In addition to that, learning orientation supports customer retention and continuity of customer relationships by stimulating the firm's trust and its commitment to its strategic customers. (Raj & Srivastava, 2016).

While learning orientation fosters market-oriented behaviors (McGuinness & Morgan, 2005), companies exhibiting different approach to marketing - relationship or transactional – adopt different learning styles (Chaston et al., 2000). As relationship marketing is often seen as means to a firm's survival in turbulent markets, companies that manage to learn new ways of working closely with customers, eventually manage to differentiate themselves from competition. While in the stable markets where customers are looking for standard products, single-loop, adaptive learning is sufficient for optimizing organizational efficiency, in periods of discontinuous change firms should adopt double-loop, generic, learning style to be able to develop new practices, perspectives, and operational frameworks (Chaston et al., 2000).

To summarize, learning orientation can stimulate market-oriented behavior while market-oriented organizations can develop generative learning. Learning-oriented companies are able to develop superior knowledge about customer's evolving needs, are able to develop appropriate responses to those and foster closer customer relationships. In the periods of discontinuous

change, generative learning, as a result of relationship marketing and double-loop learning together with customers, is critical for companies to differentiate themselves from competition.

2.2.2 Customer role in innovation

Christensen and Bower (1996) define technology as "the processes by which an organization transforms labor, capital, materials, and information into products or services" (Christensen & Bower, 1996, p. 198). Then, innovation defines the change in technology. For successful product innovation a firm should possess technological and customer competences (Danneels, 2000) (Figure 3, a). While technological competence relates to a firm's ability to design and manufacture a product with certain features, customer competence relates to the ability to sell this product to its customers. Customer competence is based on such market-related resources as, for example, sales access to customers, customer goodwill or the reputation of the firm that help establish proper communication channels for information exchange between the company and its customers already during development and commercialization stage. (Danneels, 2000)

Besides the contribution of technological and customer competences to product innovation, new products can also serve as means for organizational learning about technology and customers (Danneels, 2000). What is more, with strong impetus from customers, that represents their demand and can relate to strong customer competence, companies can develop required technological competences needed to innovate (Christensen & Bower, 1996) (Figure 3, b). However, according to Christensen and Bower (1996), customer power in innovation process might have negative consequences for firms. Their research shows that customer orientation can eventually lead to failure of leading firms as, being too much focused on the needs of their current core customers, they can fail to adopt critical new technologies and enter new markets. Meanwhile, with existing technological competences, firms can easily follow the market opportunities that address needs of emerging customer groups. Despite this, they do not necessarily consider following new market opportunities due to their incompatibility with the needs of the current core customers (Figure 3, c). Thus, customer orientation can lock companies on their current core customers, limit and direct its innovativeness towards satisfying their needs and, as a result, jeopardizes their competiveness in the context of radical technological change. (Christensen & Bower, 1996)

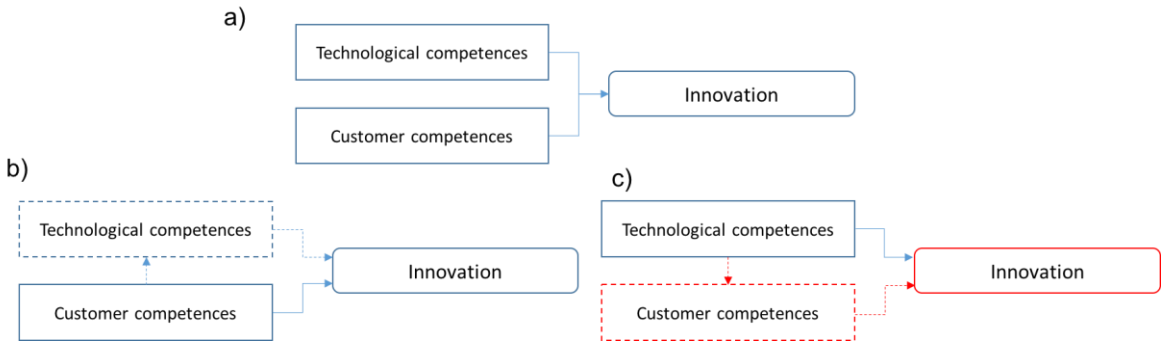

Figure 3. Illustration of the role of technological and customer competences in innovation

In response to Christensen and Bower (1996) and their statement regarding negative consequences of customer power, Slater and Narver (1998) call for necessity to subcategorize customer orientation into customer-led philosophy and market-oriented philosophy. Customer-led philosophy is concerned with customers' expressed needs being short –term and reactive in nature while market-oriented philosophy deals with customers' latent needs and is more long-term and proactive in nature (Slater and Narver, 1998). Market-oriented businesses are aiming at creating superior customer value by satisfying both expressed and latent needs of their customers as well as obtaining information about market, competitors and technology trends in systematic and anticipatory manner. Quickly learning from and about different kinds of customer needs, sharing the knowledge throughout organization and acting in a coordinated and focused manner are other characteristics of market-oriented companies. These characteristics make a market-oriented company more likely to be a generative learner (Slater and Narver, 1998). Meanwhile, generative learning is essential for successful innovation (Slater & Narver, 1995). On the contrary, adaptive learning is typical for customer-led companies (Slater and Narver, 1998).

Customer-led businesses imply developing close relationship with important customers in order to gain deeper insights about their needs (Slater and Narver, 1998). Concept testing and conjoint analysis to guide development process for new product and services are also typical characteristics of customer-led businesses. Market-oriented businesses of Slater & Narver (1998) also work closely with their lead customers in product and service development. However, the notion of lead users differs in this case. In comparison to the powerful core customers who drive innovation according to Christensen and Bower (1996), lead users of market-oriented companies of Slater and Narver (1998) are the ones who are expected to

significantly benefit from a solution to their needs as given by von Hippel (1986). According to von Hippel (1986) lead users represent a group of customers with strong present needs that are to become general in a marketplace in the future. They are also expected to substantially benefit from finding a solution to their strong present needs (von Hippel, 1986). Although the insights from lead users are also constrained as those of typical users, they are more familiar with future conditions and are able to provide data about them. Hence, the capability to see future conditions and the motivation for solving their present problems are the key qualities that make lead users especially valuable to firms attempting to develop new products or services (Matthing et al., 2006). Slater & Narver (1998) also differentiate between the lead users required for customer-led businesses calling them "pragmatists" and lead users required for market-oriented businesses calling them "visionaries". Visionaries are eager to work closely with the supplier to further develop partly ready solution expecting to obtain an advantage over their competitors by utilizing new solution. They usually represent a small share of the potential market, while pragmatists represent mainstream market (Slater and Narver, 1998).

The main benefits of involving lead users can be seen in market research (von Hippel, 1986). Accurate judgements about user needs build a foundation for accurate market research. However, for novel products or for product categories characterized by rapid change, for example, in high technology markets, current market research analysis cannot be reliable, as customers do not have pre-experience to articulate their needs clearly (von Hippel, 1986). Therefore, von Hippel suggests that market research for novel products should be carried out with a group of lead users for a certain product or process. In the environment characterized by rapid change the analysis of the needs and the solution data coming from lead users can help improve the effectiveness of new product development (von Hippel, 1978).

The main challenge of the lead user methodology relates to the question whether the needs of non-lead users will later in future be same or similar to those of lead users with whom the solution has been developed (Urban & Von Hippel, 1988). According to Urban and Von Hippel (1988), the needs of non-lead users will foreshadow those of lead users if they have similar evaluative structures. This means that both groups should evaluate a new concept based on similar dimensions and attributes. If the evaluative structures between these two groups are similar, it could be fair to say that then solutions developed with the input from lead users also fulfill the needs of non-lead user group. If non-lead users relate to different dimensions and utility weights when evaluating the solution, the commercial potential of the solution might be ultimately restricted to the segment of lead users. (Urban & Von Hippel, 1988)

2.2.3 Converging organizational learning and lead user innovation

Based on the conducted literature review, I summarize the key concepts that are critical for answering the posed research questions into an integrated framework of organizational learning and lead user innovation theories (Figure 4) where red dotted square frames customer role in organizational learning.

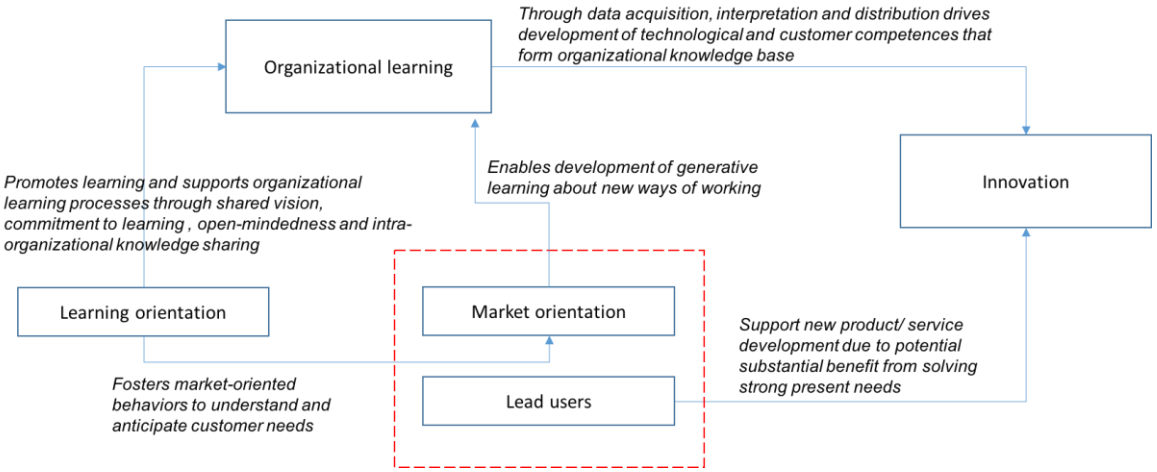

Figure 4. Integrated framework of organizational learning and lead user innovation theory

The empirical study in three Finnish manufacturing companies further aims to help find answers to the posed research question regarding the factors that affect customer involvement in digitalization-related organizational learning.

3 Methodology

In this chapter, I present the methodology of the qualitative research conducted in this study. I explain research design, research context, data collection, and data analysis before proceeding to outlining the key findings in chapter 4.

3.1 Research design

The objective of the study was to understand how customers are present in digitalization-related organizational learning of manufacturing companies and what factors affect their involvement. Given the explorative nature of the study and the objective to understand the phenomenon and expand the existing knowledge, qualitative method was chosen for the research. The qualitative method allows deeper immersion into the area of the research interest, consider various sources of information and keep flexibility along the research process, following the new trends and topics that might emerge.

As a research design for my research, I chose multiple case study. As I looked at the phenomenon of digitalization on a broader scale without immersing myself into exhaustive within-case research of one particular case typical for single-case analysis and draw comparisons, these intentions logically lead to multiple-case study. Also, since my goal was to develop a theory based on analytical generalization that would be replicable in all of the case companies, the choice in favor of multiple case study is justified (Yin, 2003). In order to keep the explorative nature and support a theory-building approach, I conducted the study with no particular theory or hypotheses to test (Eisenhardt, 1989). Following the abductive manner of the research with no separately set time periods for literature review, data collection and data analysis, I was able to adapt the subsequent steps of the study based on the results and new areas of interest that raised during the process. Disadvantages of this research design are related mostly to the greater amount of time I had to spend on analyzing multiple cases. Due to the explorative and abductive nature of the study, converging first-order open codes and more theory driven second-order codes into data structure eventually took me more than a year.

3.2 Research context

Three Finnish manufacturing companies – Santiago, Arenas, and Calama - and their digitalization efforts constituted the research context for this study. At the moment of data

collection all three companies were running several digitalization initiatives and were at different stages of digital transformation. The definition of digitalization was not given to the companies on purpose to let them elaborate on what they consider as their digitalization initiatives. The focus of the study, however, was not on the initiatives themselves, but rather on the organizational learning around them.

All three companies held a strong leadership position in their respective industrial goods and services industries. Each firm had a considerable share of service sales and was seeking for further growth in expanding their service business, although the traditional industrial goods sales constituted the larger share of sales volume for all three case companies. They were of similar size allowing for comparisons.

Each of the three case companies were similarly describing the steps that they needed to go through in order to be able to compete in digitally enhanced environment and grasp the benefits or digitalization. During their existence, each firm managed to build high-class engineering capabilities, which further formed a foundation for digital capabilities. However, the companies were demonstrating different level of maturity and different approaches to embracing digitalization in their organizations and in their offerings allowing for analysis why and how these differences occurred.

3.3 Data collection

The data collection took place between February and June 2015 as a part of the TEKES-funded research project. In approaching the case companies, the following process was mainly used. The research group members were sending emails with the research presentation to CEOs of potentially interesting companies trying to reach as high level of the organizations as possible in order to be able to subsequently follow top-down interview process starting from top-management and then continuing with lower level management of the organizations. Based on the responses, three case companies were defined. Publicly available information, e.g. the companies' annual reports, was used to formulate initial idea on the role of digitalization and its importance in the current strategic agenda of the companies to get prepared for further steps in data collection process.

As a primary data source for the study semi-structured interviews were used. In total, 21 interviews were carried out, during which 18 individuals from different managerial levels of the three case companies were interviewed. In order to form a more holistic understanding of the

entire organization's attitude towards digitalization, we interviewed people who were driving digitalization efforts in the companies as well as people who were not directly involved in those but whose areas of responsibility were related to digitalization.

Initial interviews with top management helped to understand the place of digitalization in the company's strategic agenda as well as main business areas embracing digital technologies. The lower level interviewees were recommended by top-management as people who were actively involved with the companies' digitalization efforts and were capable of providing expert view on their implementation process and on overall company experience with digital technologies. Despite the top-down approach in gaining access to the potential interviewees, the voluntary nature of participation in the interviews was emphasized.

Initial interviews, along with preliminary literature review and research team discussions, contributed to creating an interview guide (see Appendix). However, in order to support the selected data collection method of semi-structured interviews, the interview guide was not strictly followed. In the light of explorative nature of the study, this helped to keep the natural flow of the conversations and let the interviewees express their thoughts on the topics that they considered particularly relevant. Interview guide was used mostly to keep the conversation focused on the objective of the research and to make sure that all areas of the research interests were covered during the conversation. The questions for the interviews were selected from the interview guide based on their relevance to each interviewee, the discussed topic, and the natural flow of the conversation.

The interviews were held mainly face-to-face with each interviewee, except for one interview where two interviewees were present in the same session. All the interviews were audio-recorded and transcribed word-to-word using transcription services. The transcripts were checked and corrected by the interviewers before uploading them to the qualitative analysis software file.

The main ethical considerations during data collection were related to the interviewees' anonymity and confidentiality. The trustful atmosphere in the interviews allowed the participants to be open in their communication and provided the ground for gaining insightful answers to the posed questions.

3.4 Data analysis

For the purpose of managing information, all transcribed materials were uploaded to Atlas.ti software, where they were coded and prepared for further analysis. During the first, open-coding stage of the analysis, the codes were created and named based on the data without any particular theoretical framework in mind following the Gioia method (Gioia, Corley, & Hamilton, 2012). The goal was to spot the ideas that might be relevant for understanding the phenomenon of digitalization. In order to better organize the empirical data during open coding I was keeping in mind organizational learning and lead user innovation theories as sensitizing theoretical concepts (Eriksson & Kovalainen, 2008). During this stage I open-coded all the interviews for Arenas and Santiago.

Following the Gioia method, I formed nine thematic codes based on the data and literature on organizational learning and customer role in innovation. The thematic codes were formed with the goal to understand the role of customers in organizational learning related to digitalization. Seeking for the answer to the posed research questions, I then formed a network view of the thematic and open codes to understand the connections between them. At this stage, I also coded the rest of the interviews with Calama using both existing and new open codes. The overlapping open codes were then merged and some were rephrased to better describe the content.

The nine thematic codes were categorized into three themes – "Customer presence in digitalization", "Learning orientation", and "Organizational learning". The final data structure showing the overarching themes, second- and first-order categories is presented in Figure 5.

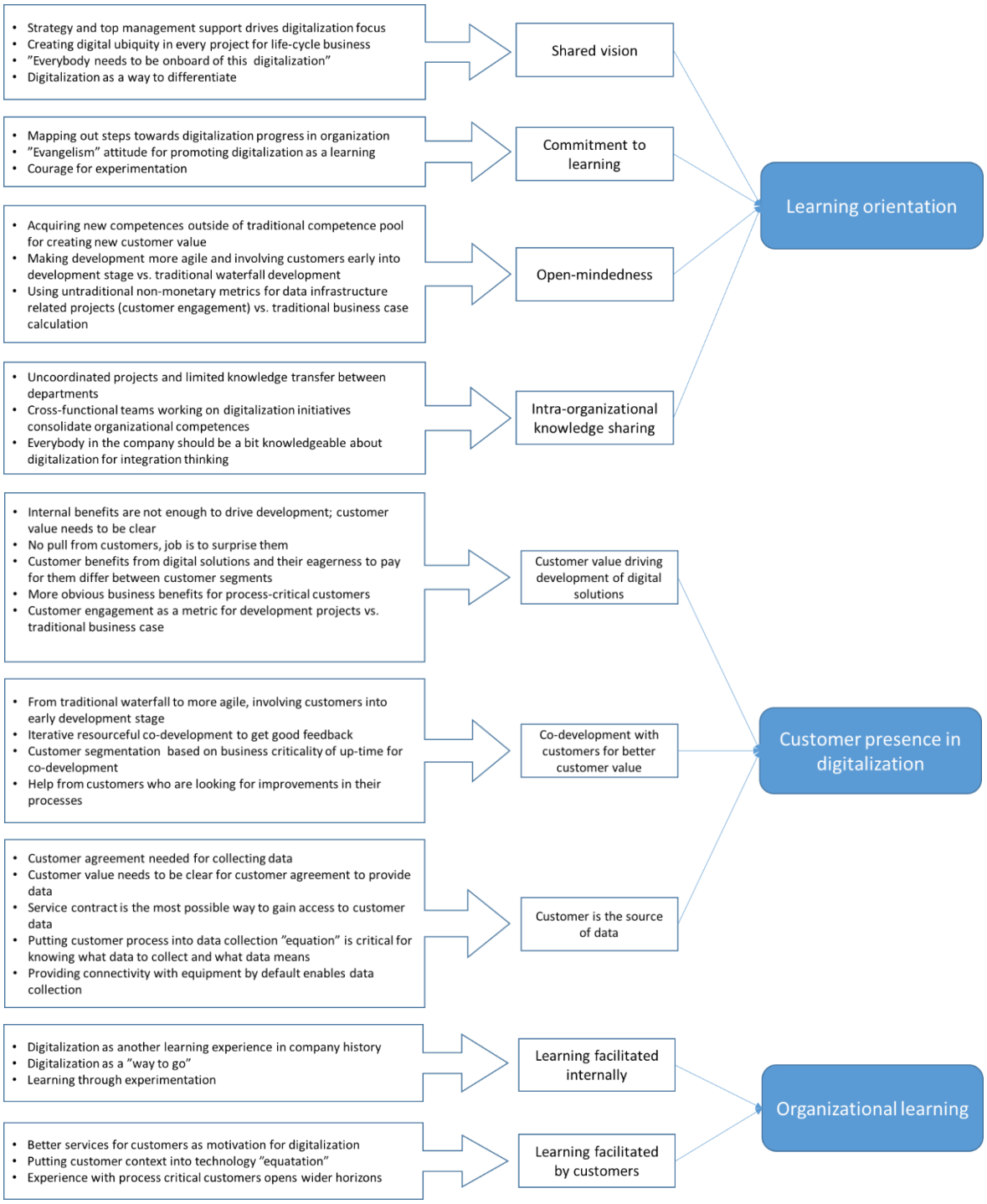

Figure 5. Data structure

4 Findings

Based on the formed data structure, I elaborate on each of the overarching themes and the second-order categories to explain their manifestation in the case companies.

4.1 Learning orientation

Based on the data analysis, I interpreted the open codes to belong under four theory driven thematic codes– 'shared vision', 'open-mindedness', 'commitment to learning', and 'intra-organizational knowledge sharing' with 'Learning orientation' as an overarching theme. I will further discuss the manifestations of digitalization-related learning orientation in the case companies through the above-mentioned four categories (Table 1).

4.1.1 Shared vision

Shared vision, as one of the elements of learning orientation, supported coordination and focus of digitalization-related learning process. The case companies proved that digitalization was not an activity to be carried out in silos; neither could it be a responsibility of one single organizational unit. Instead, digital ubiquity was needed to be a critical part of learning digitalization. For example, in order to enable services based on remote connectivity, the equipment needed to be designed and manufactured in a certain way that would enable remote connectivity capabilities and simplify gaining access to the customer equipment data. The organizational mindset and organizational structure needed to be set so that digitalization could become a part of every product.

> *"I think everybody needs to be on board of this digitalisation. We will benefit in the services, if this digitalisation is already embedded as a part of our R&D, the new design, if we develop some new hardware product, that it has been taken into consideration that we need a connectivity for example afterwards. -- If they take into consideration already in the design phase that how to connect, which are the, what do we want to see at a later stage. So everybody would need to be on board of this and I think the highest governance is really, in a board of managers' level, where these are discussed, this digitalisation." – Interviewee A, Arenas*

> *"Of course when we think about the whole concept or whole technology for example what we are doing so this, digitalisation and industrial internet have, it has its hands almost everywhere in the design. For example if we want to get some information from any device, it needs to have the connectivity and this device need to produce the information that we are gathering. Then it's really often like that some part of this digitalisation it's part of basically every project. If I had to think about the lifecycle earning models and how to make models that, in the next 30 years and, how we could implement those kind of features in that particular device or part or piece of machine that it helps us to make the business. So in short, yes we have in organisation we have one part of this solutions and then it's also have to be mindset for everybody, that they also take in account that this thing is part of the product really, everywhere." – Interviewee C, Santiago*

Table 1. Manifestation of learning orientation towards digitalization in the case companies.

LEARNING ORIENTATION	ARENAS	SANTIAGO	CALAMA
Shared vision	• Digital ubiquity in every project is seen as a way to drive digitalization and supported by top management and organizational structure • Digitalization is seen as a way to differentiate from competition; top management supports the sense of urgency to adjust	• Digital ubiquity in every project is seen as a way to drive digitalization and supported by top management and organizational structure • Digitalization is a part of company strategy and seen as a way to differentiate from competition, especially for process-critical customers	• Digital ubiquity is challenging due to product-line based organizational structure • Digitalization is a long term but not a short-term priority "Whatever we do now, we are probably too slow anyway; management slow in understanding the potential benefits of digitalization
Open mindedness	• Digitalization increased the need for broader competence pool; new people with stronger software knowledge but lower understanding of equipment were hired to support development of digital offerings • Exercising new for the company more agile development of digital solutions with strong focus on customer needs and untraditional metrics for investment decision making	• Digitalization increased the need for broader competence pool; the focus of combination of people who know customer business and new people who bring new technology into the company • Exercising more agile development with the help of process critical customers where the business case is more clear	• Enhancing software competences by acquisition of new business • Company culture not supporting agile development • Focus on traditional profitability KPIs and scoring system for platform-related projects
Commitment to learning	• Service division head, as a visionary, promoting digitalization in the organization and experimentation with latest technologies • Experimentation with digitalization in Service division raising excitement in the company	• Chief Digital Officer, as a visionary, promoting digitalization in the organization • Culture of experimentation in the company supported focus on delivering the best customer value and "killing" solutions that were not fully fulfilling it	• Lack of courage to experiment with digitalization due to unclear potential benefits and low commitment from leadership; new leaders are expected to bring change
Intra-organizational knowledge sharing	• Cross-functional teams working on digitalization projects to ensure knowledge sharing and integration thinking • Digitalization initiatives mostly under Service division	• Sharing and consolidating knowledge about digitalization and needed skills in project teams • Digitalization projects together with other projects organized in Research and Innovation or Product management side of organization	• Intra-organizational knowledge sharing limited by productline- based organizational structure

In case of Calama, the product-line based organizational structure was seen as an obstacle for creating digital ubiquity. The independence of product lines limited the abilities for holistic understanding of the potential benefit that the whole organization could eventually gain from digitalization.

> *"If it's a machine product line, for example the.. purely a machine product line, they don't see any benefit for their own narrow focus area at the moment. And in the future, the benefit might not be in building the machine. It might be on a higher level, on Calama level. That's probably the biggest problem there. When you're building a machine, the person who builds the machine and, they won't see the benefit. Not now, and not necessarily, they might not see the benefit for building the machine in the future either. The benefit is on a higher level. And then again product lines that are tied to, whose machine sales are tied to automation, they'll see it more easily, the common benefit. " – Interviewee D, Calama*

The support of top management in the case companies proved to be essential for establishing shared vision to move forward with digitalization. Several interviewees stated that it was one of the key drivers that were signaling the need to progress on the topic to the whole organization. While in Santiago and Arenas the strong support from the CEOs and clear vision towards the critical role of digitalization in companies' competitive strategies was clear, the limited commitment and understanding from Calama top management was an obstacle for developing digital competences.

> *"Of course we have been in relatively good position in that sense that our CEO has been very supportive in these initiatives all the time. So really from the top management there has been lots of support and actually, this would not, never ever happened if (CEO) couldn't have said that we will start doing this, make sure that this happens. So he was and the whole, the upper layer of the company was very much supporting this." – Interviewee E, Santiago.*

> *"I'm always updated on that part. It helps me in the communication. But it also, it also gives a signal. If I'm interested in this, if I think this is important, if the part, then automatically people see this and hear if I talk a lot about digitalisation and what we are doing the things then people see, wow, this..--So it's the small signals. That's what drive a lot also in.. If I'm totally not interested in digitalisation, I'm sure there will be a lot done but maybe some people would not be so focused on that. -- But I think this is exciting and I think this is actually the really the future, and the way for Arenas to diversity itself, differentiate ourselves from the competition." – Interviewee B, Arenas*

> *"The reason for that was that we hadn't introduced digitisation to the agenda of the upper management and there onto the strategy of the entire firm. We had no more than a handful of people who understood the need to do that, and it was a long road to establish the understanding that these have to be done, they'll create business benefits for someone in the world: either for us or solely for others. It was a question of whether or not we're one of those who benefit." – Interviewee F, Calama*

> *"There are lots of opportunities specifically in IoT or Industrial Internet and mobilisation and other stuff, but it's that they won't move forward unless the management has the understanding. Either they're aware of it themselves, because many companies have managers with a background in ICT and thereby have known these things for the past ten years and have implemented and will implement them. But those in the management with a background only in engineering, the difficulty there is to push things through before the understanding at the management has been created and the issue has been brought onto the agenda." – Interviewee F, Calama*

For Arenas and Santiago, digitalization was clearly a part of their competitive strategies and seen as a way to differentiate themselves from the competition. Even though considered more as evolution rather than disruption, it was still seen as the only possible future that required constant challenging of the firms' way of working to stay on the leading edge. For Calama, even though the new company management was more dedicated to digitalization, the company culture, or "nature", was seen as an obstacle to get on the edge of digitalization.

> *"So you have to be on the leading edge on this part and the one who's not adopting this, they are going to be losers, because the way you interact with your customer is going to be totally different in the coming years. This is a survival game and you have to be on the leading edge to it. It's a huge matter." – Interviewee B, Arenas*

> *"So basically you can't be too fast at the moment. Probably whatever we do now since we are not by nature we are not the fastest company in the world, we are very traditional, whatever we do now we are probably too slow anyway so it's very difficult to over-invest or overreact." – Interviewee G, Calama.*

While all three case companies clearly had digitalization on their strategic agenda, the priorities for digitalization differed. For Calama, digitalization was not seen as top priority to ensure business profitability. As it was said by one of the interviewees from Arenas, there was indeed a need to have a certain level of organizational "hygiene" in place to consider growth opportunities related to digitalization. In both Arenas and Santiago, the profitable business divisions that were willing to find new growth opportunities drove digitalization efforts.

> *"Digitalization is an enabler that is ensuring that we are in this business still after 2018. But if we are looking at what do we need to accomplish to take Calama to the next level from the profitability point of view or the shareholders' value point of view it's not digitalization. There are more traditional things to be done now to get the profits to the next level. -- Really if I'm thinking that what are the three or four top things that we need to achieve during the next two to three years to take Calama to the next level, there are other things as well. --Digitalization can play a role in that one but it's only a small thing there.." – Interviewee G, Calama*

> *"So, it's like normal businesses, what I normally say is that, in any business you need to have stability, then profitability and then growth. You cannot, if you're profitable and not stable, you cannot develop these things, because it's going to, always going to be down-prioritised. So you need to be a profitable business, from the basis, and when you're doing that and as bigger company you have a bigger revenues you have, the cost for this, doesn't affect the overall, target. -- But if companies are not really profitable, and not, then you have the tendency to save, save, save and then these exciting new things don't really pop up. So you have to be, profitable at the basis. If you're not, you better get the company in shape, and then you can start jumping on these kind of projects." – Interviewee J, Arenas*

4.1.2 Open-mindedness

In the given research context, I was looking for the examples where organizations were challenging their normal ways of working to adjust to the new environment set by digitalization. One of the biggest changes that required adaptation from the case companies was related to a

lot broader competitive landscape where they were no longer competing just as industrial equipment manufacturers. The new environment set by digitalization required from them deeper understanding and integration of software and e-commerce businesses.

> *"That is probably quite, one big change that we need to create of course those products and those features we are present there where the customer wants us to be present. And then also have the competences and ability to generate that kind of services. It's also like a whole new industry for us, if we look at the, we are being a traditional machine-making company if I would say that traditional way, and now we are doing things like, spare part selling in the internet or things like that. The whole way of producing that kind of offering and, how we generate our webshop and what things need to be in good order of that, and all the data things like that. That is something it's very different from the old manufacturing industry world." – Interviewee C, Santiago*

The changing environment also challenged the traditional competence pool, as in order to meet the new market requirements companies had to look for the missing competences both internally and externally. This was necessary in order to be able to, first, capture new customer requirements and, second, create solutions that would meet them. While in Calama, the competence pool was enhanced by acquiring new software business, in Arenas and Santiago the competence pool for working on digitalization was formed both by internally and externally hired experts. In some cases, it required hiring people who were unfamiliar with company equipment, but who were able to utilize the new data and new technology for creating digital offerings. Thus, the combination of the externally hired people and people who were able to recognize the value for customer and were normally internal for the organizations, was considered crucial for developing digital offerings that were able to provide new customer value.

> *"It was that part that we had these guys who know the equipment, the technology we have delivered, how it behaves and the like. But we said, we realised that, to make different kind of a sense out of this information, we need some different kind of a competence. That's why this.. handful of these guys were hired. They really didn't know anything about our technology or our equipment as such." – Interviewee A, Arenas*

> *"So we've had just to little bit look out of the box where those people's, where they are, where they come from. They're not necessarily coming from the traditional industry like metal industry or automation. Those competences can be somewhere else. We've been quite lucky to, people have been recruiting good people here. Actually we have quite much, young people here have the latest knowledge with, whatever is moving in the field of technology they know it and they have some work experience enough to be efficient. We need quite much also that kind of experts that not everybody need to know how the [equipment] works. It's enough if they know the databases, system integration, user experience and that kind of things. Or mobile, user interfaces whatever. They can then make their part of the puzzle.." – Interviewee C, Santiago.*

> *"So, it's like that what you described, competences, new competences what we need in the company. Quite much of that has been taken by recruiting new people. --So, some guys have been very clever to find those competences that those are coming you know from out of the company. Then, we need also those people have been long in the business, because they know typically what the customers do with their [equipment], and they can imagine the value for the customer, so it's a good combination, we have like an ability to do the things and on the other hand we have a good understanding from the customers' lives. So, somebody can really, you know, wear the customers' boots and imagine the daily life, what is the headache for the customer. And, we have pretty good like sales guys, who have been like 20 years in the company, and they're really good at telling what they*

need, what they need daily, what they need weekly, what they need morning time or what they need afternoon." – Interviewee C, Santiago.

To continue with adopting new ways of creating customer value with digital offerings, another example of the new way of doing things in the context of digitalization is related to solution development process. Previously manufacturing companies could rarely execute iterative product development as the product could be only tested and shown to customers when it was ready for use or, at least, able to perform main functionality of an industrial product. Digital technologies have brought up the possibilities of the development happening in smaller iterations and closer interaction with customers. However, the high uncertainty of the value that could be delivered to customers with the digitally enhanced solutions also put additional pressure on the companies to switch to more agile development to better shape customer value.

> *"It's unbelievable how it has been but, a lot of these developments, related to digitalisation or the applications at least, is so that, we are standing on top of the hill and we have these waterfalls on it. -- Standing on the top of the hill we should, know already what is happening down there. And the fact is that that doesn't work. The customers' business, the life is changing, human being's behaviour is changing, and especially with this digitalisation, technology is changing. -- So that you develop something, years, and then you have something and you bring it to the market. It's not there anymore. So what we try to do is that OK, we believe that there is a value for customer, we build some kind of a mock-up or proof of concept. One way or other, something concrete to the customer that he can touch, he can see, he can feel, smell, something, which touches the senses. Then we.. then the customer need to say that, yes, this is something I'm absolutely willing to pay. Then we move on, and we can even iterate that with the customers. But, that is a big change in our world.." – Interviewee A, Arenas*

> *"If I say some trend for it, so we try to be more agile with that, so it means a lot more fast. So, we're in some cases we're going earlier to customers and we try to let's say steer the development process in an early phase already so we can look like, let's say kill some features and then adjust the direction what things we do with the help of the customer. So, a really, a little bit faster with that. That is the main trend. So, already before, it's like, let's like fully productised and everything's completed, we try to be prior to that already in the market. But, it depends very much on the product and the nature of the thing that we're doing." – Interviewee C, Santiago*

Moving from traditional value creation using waterfall development to new ways to create value for customers utilizing more agile development practices required also adjustment of the decision making metrics and process in regards to digitalization initiatives. While, traditionally, companies used business case as the grounds for project prioritization and investment decision-making, it was clear that traditional metrics were not fully applicable for digitalization initiatives. In cases where potential benefits and return on investment into digitally enhanced solutions is even more challenging to estimate due to high level of uncertainty of their commercial success, companies had to use scoring systems for project prioritization. This new logic was particularly applicable to platform-related projects that were supposed to build a foundation for new digitally enhanced products and services.

"If we go to the research side, then it's typically not the business case that is dominating the decision making.—Of course there are other projects also that have more or less this kind of , justification because they are building this their kind of of next generation platforms, let's say for automation and remote services. So this kind of platform projects, in a sense.. Of course there has to be the payback some day, but it is really difficult to make money out of the platform, because the services and products are actually built on top of it." – Interviewee E, Santiago

While for platform-related initiative Calama also utilized scoring systems for investment decision-making, the company's focus on profitability and lack of clarity in linking digitization and profitability in the short term, often made them prioritize other projects with more clear business benefit.

4.1.3 Commitment to learning

The manifestations of promoting learning culture in organization, particularly, in regards to digitalization, were combined under commitment to learning. It was mainly manifested by mapping out the organizational "path" towards developing digital capabilities, often by experimentation, and "evangelism" attitude towards following this path due to uncertainty of the benefits of digitalization.

While there was a common view on the steps that organizations needed to go through to develop capabilities for setting up data source, data transfer, data storage, and data analysis, the approach to do that varied between the case companies. Due to the fact that potential new customer value and its commercialization success were highly uncertain, Calama had difficulties in calculating the business case to justify investments into development of digital infrastructure. "Hygiene" factors and support from top management, that were mentioned earlier, were barriers on setting up the commitment to learning along with lack of "the courage to experiment". The expectation was that the new leaders would bring more experimentation into organizational culture.

"Previously, we've made clear-cut business calculation on how many euros it'll generate, but there isn't a fakir in the world who could calculate how much the digital reforms will generate? It can be -1,000,000 or +50,000,000 or any other figure regardless of the project depending on how well it succeeds. It took a while to recognise that we don't always have to have a plan ready for everything. Even if you plan something for five years, you may not be able to carry it out, but you must have the courage to experiment. I think these issues have over the past few years fallen into place partly because we've gotten new leaders for operations or business areas involved and people have changed." – Interviewee F, Calama

Both for Arenas and Santiago, having visionary people was critical for promoting learning needed for digitalization. In Santiago, on top of overall management support for digitalization,

the role of visionary people was to provide direction when the final point of learning was still uncertain and to cultivate the culture of experimentation.

> *"This kind of projects, they always need to have like, this kind of like Evangelist kind of attitude. Somebody has to take that role, in a way to spread the word and tell that alright this is coming, it's good and it's developing, it's not all there yet. It's not ready, it's never ready." – Interviewee H, Santiago*

According to one of the interviewees, Santiago Chief Digital Officer acted as a visionary of digitalization. In Arenas, the commitment to learning was demonstrated and promoted by the leader of the company's service division. While the digitalization was clearly supported by the top management and CEO in particular, the commitment to learning and the learning process about digital technologies and opportunities they bring for creating customer value was taking place mostly in service division due to iterative nature of relationship with customer in services.

> *"You have the people who are early adopters, who are keen on this. Our guy, our service organisation has been at very early stage, start seeing what are the advantages even though we started many many years ago, but it was only investment and learning from their part. As time moves, technology improves and things are, you realise that this is the way to go. I think today we are, pretty sold on this digitalisation today. We are, exploring all the opportunities that we can do and where we need to improve. - - Service is the most obvious facet because, service have the most interactions with customers." – Interviewee B, Arenas*

Arenas' service division was then, naturally, the home for experimentation with digital technologies. The logic was to experiment in order to learn and develop competences that could be in future utilized for creating customer value. As a result, the tangible results of the experimentation raised the excitement about digitalization inside the organization and served as a facilitator for launching new digitalization-related projects.

> *"This is a way to lift the competences on the edge and making sure that they are doing the right jobs out there." – Interviewee B, Arenas*

> *"We had quite interesting experiences -- And, that was I think a good exercise, in our company because for the first time we really, got out doing something which is not a slide, is not the doc, is not a speech, not, I mean, with something really tangible. I think this was one of the reasons why, [CEO] and many other people in our organisation got excited -- And I think this is, an important milestone, to move from, brainstorming to concrete cases which maybe brings as well concrete challenges. But, I think, we have made that step and we have quite many actions now ongoing." – Interviewee I, Arenas*

In Santiago, courage for experimentation was seen as a part of organizational culture that helped them explore opportunities and facilitate learning about digitalization. Particularly, in both Arenas and Santiago they were talking about experimenting with technology to gain understanding how it can create customer value and, then, how this value could be sold to customers. In both Arenas and Santiago, interviewees underlined positive image of failure that

also demonstrated organizational commitment to learning not only from positive, but also from negative experiences.

> *"The one thing that we're definitely very strong is that we have the courage to test new things. And, if there's something that looks attractive, sometimes even though we don't yet know how good or big business this will be, but if it looks promising, so really like put effort on that, we put the money and people there, we really look that does it give something for us. So, kind of courage, this kind of like, some smaller companies have it, so if you're like three people, let's say that we have one company and we think that what could we do because this is not selling, so it's quite easy to make this kind of like, turn the direction quickly, and of course the big companies, they are like big boats, really slow to move. And, of course, it's also visible here, but the good thing is that if there's something interesting, we really start to look at it." – Interviewee C, Santiago*

> *"I would say at least for the solution we have made these kind of like, turnarounds, they're like, if something doesn't fly, so we look that what's the problem with this. Of course, it's always challenging, especially if something is already out in the market and it has been, you know, sold well, so lots of courage to kill the product or, kill the development project even. But, this is something that we also, I would say like, we're putting those things up that we need to do those, and even recently we've done couple of those. I probably can't name it here, but there's definitely, we have seen a customer need, and we have had the solution that looks, and it's okay, it works well. Then we have seen for example that the cost is too high or the technology is not capable for all the needs that we have. So, then we have to just think that okay, we need this, but this is not the solution, so, throw out from window, then we start to look that what is the solution, it's not this what we did for the last one or two years. And then we'll find something new." – Interviewee C, Santiago*

> *"Of course, our target is not to fail, but I would be really disappointed if by the end of the year we haven't failed in anything. Of course then we are not -- Then it means that we are not, then it means that we are not thinking broad enough and we are not thinking out of the box and we are not thinking new thoughts, and that's definitely something that we need to do." – Interviewee K, Arenas*

In case of Calama, according to one of the interviewees from the top management, the organization was too slow, and experimentation was not seen as an organizational capability and a natural part of organizational culture.

> *"I think that the, I'm afraid that whatever we do we are going to be too slow. --Our traditional way of thinking, all our internal processes, decision making, how we are encouraging this trial and error methods and that type of fast prototyping. And all, it's not in our genes. I mean individually I'm sure we are equally capable to anyone else. That is not an individual level but when you put people together and the strong company culture that forms a kind of organizational capability." – Interviewee G, Calama*

4.1.4 Intra-organizational knowledge sharing

As it was mentioned before, digitalization was seen as very cross-functional and required creating digital ubiquity in every solution or project that companies work on. Intra-organizational knowledge sharing was needed both in the stage of development as well as in the stages of selling and delivering the solutions. During the development stage, cross-functional collaboration was needed to be able to capture customer need and create solutions that could fulfil it. During the sales and delivering stage, cross-functional collaboration was needed to

ensure that, i.e. the value is understood by sales and delivery organizations and, then, that it is clearly communicated to the customers and delivered according to their expectations.

The projects related to developing digital capabilities in the case companies required involvement of individuals from different departments of the organization. In Santiago, the formation of the project teams was not directly linked to the organizational structure but rather to the competences that people possessed.

> *"If we look at the organization charts, they are like , they're their own boxes. But, it's more about the competences what the people have there, so, while they are working together and they have about the same kind of field of expertise, so they are good on supporting each other. Quite often the projects are like, they are more of less like, let's say cross-functional, the different competences to complete those. So we are quite flexible then, we collect the people that have [the competences]— Quite often there can be some project related to Industrial Internet, but there is something, let's say electronics of software quite much heavily related to that so then the guy with the strong software background is leading the the whole project. So, in a way, we are pretty flexible." – Interviewee C, Santiago*

At Arenas, the collaborative work between those was said to be one of the critical success factors for digital initiatives as the project required various competences, i.e. information technology, integration management, field service engineering, etc., to be able to identify business and customer needs and create solution that would fulfill them.

> *".. And a good thing here which made the things going well and quick in my view was this very good co-operation between IM, IT, and the field service, and the operation guys Because sometimes something is developed only by IT, and when one is coming to the field, maybe the people, doesn't like it or find something wrong.. Here it was excellent co-operation, and IT here in Helsinki they made great work, great job because they went interviewing field service engineers at site to catch their need so, then it was very easy to talk each other and. I feel communication and, 360 degrees involvement of all the departments in the company, is for digitalisation… In my view everybody, every, non-IM guy, in the company should become a little bit IM. Every non-technical operational IM guy should become a little bit, knowledgeable. Because I don't see any more a possibility to have these separate silos, so we need really high, integration thinking." – Interviewee I, Arenas*

In Santiago, the organization was set up to divide research and innovation activities and product management activities to ensure the development of the offering that would be based on the latest technologies. The Chief Digital Officer together with the support from the heads of service and equipment businesses were, then, supposed to make sure that the solutions under development were offering value to customers and, eventually, could be offered to them.

> *"We have a, key person on the, both on the equipment and on the service side who are responsible for the business development, and the processes and the business development activities overall, who are part of that team. Then we have the head of the R&I, research and innovation. Who's also included is the head of product management. --My responsibility basically is to ensure that we move forward with this particular field in a constructive manner. And we take into consideration all this technology that is out in the field and the developments happening in the business side. Then the counterparts that I have then, both on the equipment and the service business. They look after the fact that, when we develop things in this pipeline that they really become products that are sellable. That can be offered to a customer. So whatever is needed in making happen, so our sales people and all*

people working in the field know all these functionalities and capabilities, how they're being packaged and how they're being offered. And then on the R&I side and also on the project management side we need to package these, elements as a part of product offering and service offering." – Interviewee L, Santiago

In Arenas, while Service business was seen as the natural home for digitalization, the previously uncoordinated nature of projects called for necessity to create a special unit that could consolidate some initiatives and allow for better knowledge sharing and knowledge leverage in new projects. The unit was formed similarly to the structure followed by Santiago where product management part served as a "window" to external world and was responsible for bringing new ideas that could create value for customers. Product development and innovation were focused more on looking through the whole technology landscape. Notably, digitalization was still seen not as a responsibility of a particular unit, but rather as the connecting "glue" for better information sharing between different elements combined into Service operations.

"We had several products but they were developed but they were developed in several different parts of the company. And we had projects ongoing but they were not coordinated. There was this digitalization and, the need for more services in this area made in evident that we need to have a dedicated team organization to do these things." – Interviewee K, Arenas

"These are organizations that are different organizations and they are linked, or they are swimming in the same water. The digitalization between it's a commonality, and the information is shared within, everybody is linked to each other". – Interviewee J, Arenas

The product-line based nature of Calama business made the intra-organization collaboration more challenging for them. Similarly to Arenas, the natural home for digitalization at Calama was the business division that had a cross-business overview and potential for collaboration with other business lines through offering development. However, this indeed supported digital ubiquity for products that were done in collaboration in-between the business lines, but left quite limited opportunities for intra-organizational collaboration in the rest of the cases.

[Question: How has the implementation of the projects been organized? Do you have a separate unit for each project?]

"It's basically a thin red line for our projects, but in accordance with how we've agreed to carry out our budget and roadmap are projects that are owned by different business units, which carry out the project work. But we also strive with various means network between the units and divisions so that the digitalization projects talk to each other. You could say that the implementation is our business, business reliabilities and the associated product development efforts are in the business lines. We effectively have partitioned organization. We have no joint R&D resources. They carry out their own projects as they did before with [equipment]. Now they are simply working on digital projects with a similar mode." – Interviewee F, Calama

"If it's a machine product line, pure a machine product line, they don't see any benefit for their own narrow focus area at the moment. And in the future, the benefit might not be in building the machine. It might be on higher level…That's probably the biggest problem there. And then again,

product lines that re tied to, whose machine sales are tied to [this business line] they see it more easily, the common benefit." – Interviewee D, Calama

4.2 Customer presence in digitalization

The theme of customer presence in the companies' digitalization efforts evolved during the the initial steps of coding the interviews with Arenas and Santiago. Customers' readiness to pay for new solutions was supposed to define their potential commercial success. All three case companies were sharing the opinion that the technology was ready to provide digitally enhanced solutions. However, as it was put by one if the interviewees at Calama, the challenges "shifted towards the other end of the spectrum" where companies now needed to find the way to utilize the technology for the benefit of the customer, clearly also looking for opportunities commercialize on the digital technologies.

" We've for some time had the possibility to do these things technically, but it's been either so difficult, burdensome or expensive that it hasn't been financially profitable. The consensus about the Industrial Internet is, and what I believe personally, is that the technology is now ready for implementation in terms of price, quality and other aspects, and that the challenges will arise from the business side. Even though the technology will definitely advance and new opportunities will arise, but the challenges have shifted towards the other end of the spectrum." – Interviewee F, Calama

"It's always you need to show the value to the end customer. If it's very very clear, then there's no question basically. The organisation is fine. Let's do it and develop. But when you have to choose, should I do this project or this project, then you start wondering which brings more value to the customer of course. Then in that situation if you're doing something that is very advanced, that nobody's actually doing but you're first in your industry doing that, how can you estimate it on the value or how can you estimate the payback for the company. That's very very challenging." – Interviewee E, Santiago

In their attempts to create commercially successful digitally enhanced offerings and the needed infrastructure to support them, the case companies launched various digitalization initiatives. In this research, I identified that customers were present in digitalization efforts of the case companies in a particular way. The presence of customers can be described through three categories – 'customer value as a driver for developing digital solutions', 'co-development with customers for better customer value', and 'customer as the source of data'. The manifestation of customer presence in digitalization of the case companies is summarised in Table 2. What is more, the customers of all three companies could be split into two categories - "process-critical" and "process-noncritical". "Process-critical" customers, vs. "process-noncritical" customers, represented the group of customers for which the manufacturer's equipment played a critical role in their operational processes. Thus, "process-critical" customers were interested in improvements in uptime or efficiency of the manufacturer's

equipment that the supplier could offer them. The differentiation between these two customer groups is important for further discussion on the relationship between the three categories of customer presence in digitalization of a manufacturing company.

4.2.1 Customer value as a driver for development of digital solutions

Customer value as a driver for development of digitally-enhanced solutions was considered in opposition to the pure focus on internal efficiency. The development focus varied between the companies and even within the companies when serving different customer groups. For both Arenas and Santiago, internal efficiency was no longer considered enough to invest into development. While initial digitalization efforts were related to enhancing product functionality and efficiency, the focus for Arenas and Santiago moved towards the stronger orientation on customers' process and business operations.

> *"So what we try to do is that, already with this, listen the needs from the market and from the customer because in our case, especially in the services, that's where we, ultimately it's a lifecycle thing. We make our money with the.. If we can provide something to the customer that makes them, more.. If we can do it so that they make more money, they make more business, then we have something, and that's something that they are willing to pay for. But whatever we now then bring into this development and the like, so we challenge it that OK, what is the customer value." – Interviewee A, Arenas*

In pursue of customer value, Arenas was taking a more proactive approach in trying to identify, first, the needs of their customers and, second, the ways to enhance the customers' business with the new technologies, even though their customers would not necessarily actively ask for new digitally enhanced solutions.

> *"The demand is not, the thing is that, demand is, no one is asking for this. --There is no asking. They are used to doing certain things, which they always have done. So your job is to surprise them, with things that makes lives much easier to them.– Interviewee B, Arenas*

However, while not asking for the new solutions, due to the critical nature of Arenas equipment for their customers' business their "process-critical" customers were interested in the solution that could help them improve the efficiency of their operations. This, to great extent, helped to better identify customer value as the improvements that Arenas could propose to their customers could have a considerable positive impact on their operations. Due to its diverse customer base, Santiago was facing different level of openness of their customers towards digitally enhanced offerings.

Table 2. The manifestation of the customer presence in digitalization in the case companies

CUSTOMER PRESENCE IN DIGITALIZATION	ARENAS	SANTIAGO	CALAMA
Customer value driving development	**High** • Strong focus on customer value over internal efficiency; the goal is to "surprise" customers; customers are interested in improvements due to the criticality of the equipment in their processes	**Medium** • Customer value differs between customer segments; more obvious benefits for process critical customers	**Low** • Focus on developing digital infrastructure
Co-development with customers for better customer value	**High** • Customers are involved into prioritization of requirements and validation of the benefit delivered by the new digital offering	**Medium** • Support and help from customers who are looking for improvements; other customers "haven't yet woken up"	**Low** • Passive " wait and see" attitude of customers; no co-development
Customer is the source of data	**High** • Looking for improvements in uptime or efficiency due to criticality of the equipment, customers are ready to provide data access; service agreements enable data access as service is " the most obvious facet for digitalization"	**Medium** • Access to customer data through service agreements: clearer customer value enables data access to process-critical customers • Remote monitoring capabilities provided as a default functionality	**Low** • Lack of examples of customer value limit ability to gain access to customer data • Providing remote monitoring capabilities by default is limited by the lower price of equipment

> *"It's clearly visible to us also that, between different customer segments or industries, there is different levels of readiness to, try new things, to try to search for that, let's say increasing productivity, and even within customers, in a given segment there is quite a lot of differences. Some are more traditional and some. But there is some that are very keen on trying, all kinds of things and ready to, and understand that it's important to, follow those trends. Some who would not change, no matter what." – Interviewee M, Santiago*

The customer base of Santiago included both "process-critical" and "process-noncritical" customers. As mentioned earlier, Arenas equipment was mostly process-critical for their customers. Similarly, for Santiago "process-critical" customers the benefits of digital solutions were more clear both to the company itself, that boosted the needed development, and to the customers, that made the commercialization opportunities more clear. However, there was a large group of "process-noncritical" Santiago customers for whom the benefits of digitally enhanced offerings were not necessarily clear.

> *" It's not like I mean that's one, even everybody's talking about the digitalisation and industrial internet we cannot forget that, there is still a huge amount of industrial customers, that are not into this yet or not interested about have not woken up, do not see the benefit there are some industries that very clearly cannot (wake up) for, good reason why would you invest into something like this.*

You have to have something for those customers also. We cannot forget that." – Interviewee M, Santiago

In case of Calama, at that stage, delivering new customer value did not seem to be the main focus of their development efforts. Instead, the company was more focusing on developing the infrastructure, or the platform, as it was mentioned earlier. When talking about customer benefit and customer value, the primary concern of Calama was lack of customers interested in digital solutions and limited scaling opportunities.

"It might be difficult for us to achieve economies of scale. The number of customers is not in the thousands, it's not even in the hundreds. There are dozens. That's a big problem for scaling, for us." – Interviewee D, Calama

In case of Calama, according to one of the interviewees, customers were taking very passive role with the attitude "wait and see" towards digitally enhanced solutions. Some ideas from customers were collected through the company frontlines, while only one company division had digitalization as a part of discussion with customers due to being more "digital" by nature. However, customers were not collaborating in development process. Generally, the majority of Calama customers belonged to the process-noncritical category. That can explain a more passive role and the lack of customer interest in improvements of Calama's equipment or services.

4.2.2 Co-development with customers for better customer value

Arenas and Santiago were involved into iterative co-development with customers in their various digital initiatives. Co-development of digital solutions with customers was seen as a way to provide a proof of concept at early development stage and as means to better shape the value proposition for customers for the novel digitally enhanced offerings.

"So what we try to do is that OK, we believe that there is a value for customer, we build some kind of a mock-up or proof of concept. One way or other, something concrete to the customer that he can touch, he can see, he can feel, smell, something, which touches the senses. Then we.. then the customer needs to say that, yes, this is something I'm absolutely willing to pay. Then we move on, and we can even iterate that with the customers." – Interviewee A, Arenas

"if I say some trend for it, so we try to be more agile with that, so it means a lot more fast. So, we're in some cases we're going earlier to customers and we try to let's say steer the development process in an early phase already so we can look like, let's say kill some features and then adjust the direction what things we do with the help of the customer. So, a really, a little bit faster with that. That is the main trend".– Interviewee C, Santiago

In the case of the customer portal development, both Arenas and Santiago were closely collaborating with customers in order to, firstly, identify their needs as a base for development, and then, to see if they managed to fulfil the identified needs with the developed solution.

> *[Answering the question "How would you say that Arenas customers may influence the development work?]*
>
> *"Very much. It's really the main source of influence. It's a huge influence and this is a principal decision that we don't let anything out what is, it's totally based on our customer need. Then how you evaluate that and, it's.. it's then of course very specifically but the principle is so that we agree a certain statistical amount of customers and we either interview them face to face or by telephone or we have agreed certain success criteria. It can be would you, their satisfaction level or of the services and then we let it out. But I, probably then two phases. One is this what is beneficial for them. And this was done in the beginning with these thousands customers so they could prioritise that what is most beneficial. And then the second was in the context of pilot is really that is this now good enough or is this something that you like or does it bring value. " – Interviewee N, Arenas*

Therefore, customers provided the critical input throughout the development process and had a substantial impact on the result of the development. Arenas particularly utilised customer need driven segmentation through which they identified customers who could be more willing to participate in the development. Eventually, the partner customers were the ones with high business criticality of uptime and stronger need for get additional support to keep it high. For the novel solutions, Santiago was gaining especially valuable support from customers who were looking for the improvements in the ways they worked. In return to the provided support in development, the companies could then be better equipped to provide value to their customers.

> *"Then you go and present to the customer that how about this. It's like this Sony Walkman, eternal example, that if that was never invented, then people would not know how to ask for it. So you can't always expect the customer or the consumer to know, what they want. Sometimes we have to show them that how would this work. But a bunch of the stuff comes from our customers of course also. The best customers are that, in this respect the best customers are those, who are all the time looking for improvement in the ways that they work and they are not settled for just, the average things but they look for it in everything. So those customers help us tremendously and, of course ,we in return help to add their value, hopefully tremendously also. It's both." – Interviewee M, Santiago*

As mentioned earlier, Calama's customer were taking a passive role and were not actively involved into co-development of digitally enabled solutions.

4.2.3 Customer is the source of data

On top of the challenges related to commercialization of digital offerings, what was making digitalization of manufacturing companies even more challenging was the separation of the source of data. Access to the equipment data was a critical element of digitalization for manufacturing companies. Only after having access to the data companies can consider other

elements of the digitally enhanced offerings related to data transfer, data storage, data analysis and potential value they can create for customers based on that data. Arenas, in order to ensure data access and to develop capabilities to analyse the data, enabled remote connectivity by default with no additional fee for the customers. The goal was to push the adoption of digitalization by their customers.

> *"The challenge we've had in this area is, maybe not doing it because we've done it for many years but, the more difficult is to get our customers to adopt this, meaning that they should, let us monitor their [equipment] and then buy the services that we are doing. It's a very conservative business that we are in, meaning that they feel that why should someone else look at our…, we can do it ourselves while we are operating. What we are now trying to get into the head of customers is that we try to get more and more [equipment] to be monitored from abroad even though we don't, they're not paying for the services. But this is also a way of building up the knowledge not only how they operate but also, we can follow it.". – Interviewee B, Arenas*

Focusing digitalization efforts on enhancing services, Santiago also realised the need to provide remote monitoring capabilities as a default feature in the equipment. As the equipment was often purchased and maintained by the different parties, having the remote monitoring capabilities already inbuilt into their equipment eased the process of showing potential value to customers when negotiating service contracts.

> *"Typically the person who would ask the investment decision for the equipment is a different person who does the maintenance. And if you go to, when you go through the investment cycle then it is, sometimes relatively challenging to get the person in charge of the investment to understand the benefits of the, predictive maintenance. -- So what usually needs to happen is that you need to hand that functionality or the capabilities in building the equipment already in the very beginning. If it is done like in our case that no charge to the customer then it makes life a lot easier. And then you start selling the benefits or you show the benefits to the maintenance manager or the person responsible for the process itself. And for them having these capabilities and having these functionalities is very, there is a clear business value for them so it's a lot easier for us to, sell the business value of these capabilities to the people who are running the facility." – Interviewee L, Santiago*

Calama management also made the decision to in-build remote monitoring capabilities to all their new equipment. These required review of the agreements with the customers to ensure the right to use the data. The data access was then defined by the company's ability to show potential value it could deliver based on the provided access. As mentioned earlier in case of Calama, the company had challenges in showing such examples to their customers, that led to limited customer data access with some customers being more prone to share the data and re-consider contractual agreements.

> *"The customers are certainly most concerned about the data and their ownership. Some surely conclude that they're not prepared to do that and others that certainly because we're in collaboration as it is and this is simply a new element of the fruitful co-operation. It varies like that." – Interviewee F, Calama*

> *"Even though we provide the capabilities for enabling this kind of communication and remote access so it's of course always we need to have the agreement about the service, if we want to use the*

data. I mean if we want to collect the data so of course the customer need to accept that we are gathering that data. There's specific agreement for that. -- Of course we need to discuss so we need to have a good value proposition for the customer why we do that. If the customer sees the benefit, then why not, typically. --. But of course there are customers that are not at all accepting that we would gather data, from any operations whatsoever. Then, what can we do. But it's easier when you have a good, value proposition what value actually the customer receives from this remote connectivity and data analytics and so on." – Interviewee E, Santiago

"And even, it was customer webinar, I think, where our customer, was speaking of co-operation with Arenas. They have a (large) fleet and the person stated that, I give whatever data if we are having this and this improvement here, so they, clearly see the dependency, and are willing to give, it's not away and they can give it for.. many providers at the same time, no, problem. But they see the benefit, because the competition in our customers' industries are very tough as well,--so whatever they can, improve there with the maintenance or operating efficiency, is a plus for them." – Interviewee O, Arenas

Customer agreement was critical for data access. The way companies were gaining the access was primarily through service agreements with customers. In this case, it was easier to justify enabling monitoring capabilities. In case of Arenas, for example, due to criticality of the equipment uptime, customers were even more eager to provide the data access hoping not only for high up-time of Arenas equipment but also for potential improvements in its efficiency. Providing remote monitoring capabilities together with equipment enabled Arenas to show some of the benefits of the services they can offer to customers during warranty period.

While for Arenas the price of remote monitoring was never mentioned as an issue on the way of enabling it, it was indeed an obstacle for Calama and a large customer segment of Santiago. The low price of equipment, that was typical for process-noncritical equipment, and the high price of connectivity in relation of the price of equipment was slowing down the process of installing remote monitoring capabilities into all the fleet.

"We are installing the boxes and the monitoring equipment already as we speak but they are still too expensive to be kind of covering 100 percent of our delivery today because it would make probably sense to put the system into every machine that we are delivering right now even without having the business yet. But when you are ready with the models --Then it would be good to have the equipment fleet already having the readiness to join this type of services. But that's not the case today because the hardware plus all the support that we need to put on the hardware it's still too expensive to be put in every and each machine without getting customer paid for it. That's probably slowing the process there" – Interviewee G, Calama.

"..Of course we are always struggling with the price, because we are talking about we are talking about the equipment that, are maybe 10,000 to 20,000 euros--. So it starts from that price level so you can't afford to put very expensive modem, in this equipment." – Interviewee E, Santiago

4.2.4 Virtuous cycle of customer presence in digitalization

The key finding related to customer presence in digitalization of manufacturing companies refers to the fact that the categories under this theme are interrelated. As it was

described earlier, customers were eager to provide access to their data once the companies could demonstrate the examples of customer value that could be delivered based on the access.

> *"But, now I would say that the typical way of how we do development is that we, technically it goes from top down, in a way that we more or less define that what is the really the value for the customer, what does the customer really need to know or what is interesting for them. --So, in order to bring this value, you need to have this data available in here. So, if you need a sensor, we need a sensor, but in a way it's defined, and we talk about the customer value. That's like the main thing. We've like, maybe before it was like that, we have these fancy sensors, let's visualise. And, then customers are like, wow, I don't really care ." - Interviewee H, Santiago*

According to one of the interviewees from Calama, the company was not able to provide examples of the additional value they could deliver to their customers based on the data analysis. Ultimately, they had challenges gaining access to customer data.

> *"We've talked about the data source and the transfer channel with customers until now. We haven't discussed data storage, but when we get to the analysis, that's when their interest will be piqued. That's what they will consider, at the moment if they let us download data from their machinery, equipment and systems, that doesn't provide any additional value for them. And we haven't had anything concrete to share with them so far, to illustrate what good it would be for them." – Interviewee D, Calama*

For Santiago, the data access could be easily justified for their "process-critical" customers, but not for the "process-noncritical" customers. More obvious benefits that their "process- critical" customers could get thanks to remote monitoring eased data access for Santiago.

> *"..when we talk about process-critical equipment, then it's easier to justify, quite many, let's say, monitoring systems or additional services that will make sure that, the uptime is increase or maximised. So, the customers of these process-critical equipment, they are, I would say, mostly and sometimes only interested in that the equipment is available when needed. -- That's why, in those cases, it's clear that if we can bring the, let's say, it can be new sensoring, it can be new service concept, it could be new services, that target to keeping the, equipment up and running, or, preventing it from failures or, making the failures more predictive, in a sense so that we are able to predict those, failures in advance."– Interviewee E, Santiago*

Co-development with customers, meanwhile, was taking place once the initial understanding of the customer value needed to be tested and implied having access to customer data. Thus, interdependence between the categories can be reflected through a virtuous cycle (Figure 6). The virtuous cycle of customer presence was easily working for Arenas due to the high criticality of their equipment. Their customers, even though not actively asking for digitally-enhanced offerings, were highly interested in improvements in uptime or efficiency of Arenas equipment and, thus, eager to provide the access to their data and participate in co-development of digital solutions. The situation was similar for Santiago "process-critical" customers, but not for their "process-noncritical" customers due to lower clarity of the potential benefit from the

provided data. The virtuous cycle was not working for Calama either due to mostly non-critical nature of their equipment in customer operations.

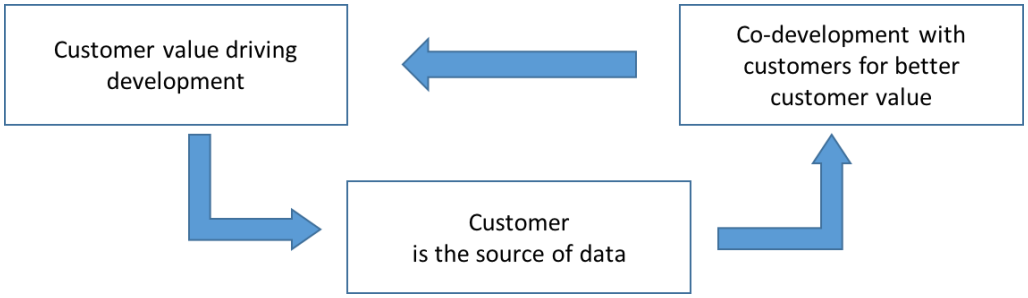

Figure 6. Illustration of the virtuous cycle of customer presence in digitalization of manufacturing companies

4.3 Organizational learning

Organizational learning in the case companies was manifested by learning that was facilitated internally and by the learning facilitated by customers. Learning facilitated internally combined examples of competence development based on the companies' prior experience with advancing technology while learning facilitated by customers was related to competence development that was based on closer interaction with customers and customer needs.

Digitalization as a phenomenon was putting additional pressure for change in the companies. Based on the previous experience, Arenas and Santiago saw their strength in adjusting to the changing environment. Arenas and Santiago demonstrated their ability to change in the past, especially by acquiring the new technological competences that were needed to adjust to the change. This was seen as a learned skill that could be applicable in the context of digitalization-driven changes as well.

> *"And, if you think about the history of the company, it's like really, like metal industry, the cranes, then they started to be like, electric controlled.. came in, after some time, but you know, there started to be like, software, PLCs controlling the [equipment]. So, it's been like, it can be like a decade or two decades in one phase, and then we move to the next. But, now pretty much what we do, the tools or environment we work at is like pretty much what the IT companies are doing. And, we're talking about the information and how to find the crucial things out of what is our knowledge and added value up there. So, we're you know pretty much taking new people in, new competences in, learning and training the old guys in the company to see the value for it, and making that kind of turns. -- That's really like, let's say fundamental for the whole company of course, it's still like, I think certain courage to do new things, that's something I feel strongly." – Interviewee C, Santiago*

> *"No I think Arenas has been, I think it's, even though it's an old heritage as I said, it's always been open to adopt to new development. Arenas has also changed many times. If you look at back to the history, has gone through many phases and changed its, what is it. Arenas is totally, if you go*

back 20 years, Arenas was a totally different company to what it is today. So I think Arenas has been very well to adopt to, new technologies. -- Where Arenas suddenly is on the front side, while competition start developing those things, recently coming up with new, while we have many many years experience from this from [business] and from other businesses. When the customer is seeing that is that okay the Arenas, has adopted this long long before anyone else. I think this is a way of showing that you adopt to what's happening at the earlier stage and I think that is, that helping a lot." – Interviewee B, Arenas

Organizational learning for the case companies was viewed through the lens of developing digital competences. What makes it especially challenging is the inseparable nature of technological and customer knowledge in the context of digitalization. While it was believed that technology reached required level of maturity to proceed with digitalization, the real benefit was seen in understanding how to utilize the technology in the processes of a particular customer. Therefore, technological knowledge was heavily dependent on customer knowledge and vice versa.

'When we started doing these remote connections it started from very basic things that how you just create a stable connection to [the equipment] what you can analyse from [the equipment], then starting to equip the particular equipment with more sensors to make sure that you understand enough of [the equipment] to make conclusions. It's not enough if you just connect to [the equipment] and you see that there's this many overalls and people moving, press the button this many time. You don't really do that much with that information. So we've been developing different kind of sensors-- This is what we've been doing for years now, not for years but a long time already. We do have quite a lot of research there. However, connecting that, that's what I meant it's important to have that customer in the equation because it still doesn't make too much good, that you are connected to the machines [..] and you are able to sensor different kinds of things in that environment. Then you need to understand that if that sensor tells you that thing, in that particular user in that way the customer uses it's likely that particular product would fail in let's say two months so you can act proactively and connect the service to that. That requires that you have enough understanding of that kind of processes that the customer is running." – Interviewee M, Santiago

The development of digital competences for Arenas started more than a decade ago with the efforts to optimize efficiency and provide remote support for their customers. As stated by one of the interviewees, digitalization was never seen as a separate initiative. The motivation for learning about digitalization and acquiring new digital competences was coming from the idea to enhance the services that the company could deliver to their customers. Particularly, there was a lot of emphasis on learning about latest technologies and competence development through experimentation. The first learnings from the digital technologies further facilitated the search for better ways to satisfy the evolving customer needs.

"I guess the thing here is that we didn't start with this, digital, that wasn't the focus. The focus was that how can we improve our services to our customers. Then naturally, from the history that we have a long history with this different kind of, digitalised products and alike we took that history and, you know, how could we take it from there to improve our customer services. So it's wasn't that, the digitalisation is an enabler for us to do our services let's put it that way." – Interviewee A, Arenas

"We have been doing, in Arenas we have been working with, digitalisation and, also, asset performance optimisation already for 15 years. We have had solutions to analyse the operations of

our [equipment] and how they are doing --. But they have been, let's say, reactive, not proactive, but they were reactive reports and, based on running data and based on, normalised or, average running data. And going forward and looking into the future, we have come to the conclusion that we need to make a giant step in this area. We need to be online and we need to be real-time, and we need to take, real data, not only averages and, we need to investigate the real, running data of each sensor so to say." - Interviewee K, Arenas

In case of Calama, digitalization, when introduced to the organization with the first initiatives, was not seen as the change that required adaptation due to lack of the link with the company business. Eventually, the path towards digitalization was seen in enhancing their service business. However, the lack of the needed infrastructure to build the digitally enhanced offerings pushed the company focus to developing the digital competences first.

"The Big Data was there but it was ahead of its time within Calama, not maybe other than that. I think that the, it wasn't sold to the organization in the right way. It was organized so that there were no connections to the real life in a way. It was a kind of theoretical top management initiative, an island, a group effort I would say that the line organization never adopted as being important." – Interviewee G, Calama

"In the beginning, the priority was services.I don't mean servicing machinery but, the service business relating to our operating system, the software. That was considered to be the first priority. But that has been moved back because that's the fifth step. We've been missing the first four steps. That's why I moved it further back. We won't be thinking about or selling optimisation analysis yet, as we don't have the tools to do that. Now it's more of a.. it's started from these four steps, what can we do with the abilities we have now, what can we make happen now. And we've built from there." – Interviewee D, Calama

Santiago was developing capabilities for remote connectivity for a long time for their "process-critical" customers. The initial learnings from these tailor-made connections showed the criticality of understanding the customer process, the role of the equipment in customer process and, then, the information to be collected to support customer process, and its meaning in the context of a particular customer. As the next step, the company was making an attempt to move from reactive trouble-shooting based on this knowledge to proactively providing "productized" services to their customers.

"We've had remote connections for more than ten years for our [process-critical equipment]. We've been able to help the customers at the site, remotely. But these have been more or less like tailor-made connections. Every time when a new equipment was, shipped to them then there was, this connection was built and it was not productised in a nice way. So there was the connection but you had to always go there and connect to that and do all these, unnecessary steps and things. But around 2007, there was this kind of a remote services programme or the vision was launched that, in 2010 we should have the capability to really provide our customers services based on these remote connections not just the single troubleshooting but, more like services on top of this. Then it started. Basically the development started with one customer. --. Then these first connections were, set up and built and there was this kind of collaboration with the customer and, the benefits were evaluated and so forth." – Interviewee E, Santiago

Based on the learning experiences that Santiago had with their "process-critical" customers and the data that they were receiving from them, they realized the need to develop

the competences further and to explore the opportunities to apply the developed competences to a large group of customers. According to one of the interviewees, this transition was supported by top management and their vision on digitalization as the way for the company to move forward.

> *"One of the things that we did look at the time were these smart features that we were building onto the [equipment] and the sort of functionalities that they provided the customer. And how this was picking up in the market and we also noticed ourselves at the time that, the information we got back to Santiago from the [equipment] how they were functioning how they were being used, was something that we could then use and utilize to a larger, and to better extent. In supporting our customers also then developing our own service operations. And we felt this was something that going forward when it starts getting more and more advanced could be really, an element that would transform the business on the equipment side as well as on the service side as well." – Interviewee L, Santiago*

> *"By 2009, we had, of course during that time during this one year many things were developed like, the products were developed (and harmony) already this kind of harmonising, was starting with these remote connections. Then in 2009 we had, 50 connections at that time. But then, the next step, was also that, we needed to do something with the data. It's not just collecting data or enabling this kind of collection but also doing some analysis with the data so, the data (gathered) was, analysed further and some reports and those were done based on the data. So some first steps of utilising the actual data. But then at that time our CEO was already very keen on this development and saw that this is the direction where the world is going actually." – Interviewee E, Santiago*

Therefore, the learning about digitalization and accumulation of competences was indeed facilitated by serving the needs of the "process-critical" customers for Santiago. For Arenas, their competence development was also strongly facilitated by the "process-critical" customers, as they were the ones targeted with digitally enhanced offerings. For Calama, the lack of connection of digitalization initiatives to business and to customers, which could be also justified by the process-noncritical nature of their equipment, limited the organizational learning and competence development opportunities needed for innovating with digital technologies.

5 Discussion

The purpose of this chapter is to discuss the findings within the theoretical background elaborated in chapter 2. The findings are reviewed in three parts to address the posed research question. First, Section 5.1 discusses the link between learning orientation and organizational learning with respect towards the findings from the case companies. Second, Section 5.2 discusses customer role in organizational learning, particularly in the light of lead user innovation theory. Finally, Section 5.3 summarizes the answer to the posed research question.

5.1 Learning orientation in digitalization-related organizational learning

Section 2.1 outlined different aspects of organizational learning, its criticality in driving organizational change, achieving superior performance, its impact on a firm's ability to innovate. Particularly, in section 2.1.2 learning orientation was elaborated through four dimensions to bring more clarity on the factors defining organizational predisposition to learn. Learning orientation is critical for achieving and sustaining competitive advantage when companies pursue differentiation strategy , as it helps to generate knowledge that is difficult to imitate by competitors (Yeung et al., 2007). Thus, when companies claim digitalization as an opportunity to differentiate, understanding the manifestations of learning orientation across its dimensions is highly important for identifying potential sources of competitive advantage. As one of the interviewees put it, manufacturing industry was not just about pieces of metal anymore. The increased complexity of products has made the traditional industrial manufacturers compete in a completely redefined environment that requires more system thinking, broader mindset, broader skillset, more efficient knowledge sharing, etc. In order to be able to adjust, they need to learn.

The findings of the research show that the level of learning orientation towards digitalization differed between the case companies. Higher learning orientation is likely to lead to more effective organizational learning process, particularly to better market information acquisition and dissemination (Sinkula et al., 1997). Arenas and Santiago have demonstrated stronger learning orientation towards digitalization than Calama on each of the dimensions of learning orientation. I would like to elaborate on several points of difference.

As one of the dimensions of learning orientation, shared vision coordinates the focus of learning and the goals that organization is trying to achieve with learning (Grant, 1996).

Digitalization was seen as an important part of the company strategy and as a potential source of competitive advantage at Arenas and Santiago. Therefore, the companies emphasized the need for digital ubiquity in every project and created a strong sense of urgency to be a part of digitalization phenomenon. Once there was a shared understanding of the role of digitalization in the companies' strategic agenda, it could support decisions that were needed for gaining experience with digitalization and developing customer and technological competences. The example of such decisions can be providing remote connectivity capabilities by default for all the equipment.

Meanwhile, in Calama, while getting on the strategic agenda of the company, digitalization was not seen as a threat to the business at that moment due to rather slow pace of change in the industry. The perception of external threat, however, can boost organizational learning activities and push the organization to more advanced level of learning culture (Tran, 2008). Organizations with more advanced level of learning culture, can be more likely to innovate more effectively and build and market technological breakthroughs as they are more likely to be committed to innovation, have state-of-the-art technology and apply that technology in its innovations activities (Calantone et al., 2002; Tran, 2008).

The companies demonstrated particular differences in their learning cultures. Promoting learning culture generally demonstrates organizational commitment to learning (Battor & Battour, 2013; Grant, 1996). While Arenas and Santiago were emphasizing their cultures of experimentation that supported their digitalization learning and could characterize them as critical learners (Tran, 2008), in Calama lack of the courage to experiment was seen as an obstacle to develop digital competences and limited their commitment to learning. Meanwhile, experimentation was helping Arenas and Santiago to develop a better understanding of the opportunities of digital technologies and how they could be utilized to create new customer value with digitally enhanced solutions, hence, contributing to knowledge acquisition and digitalization-related competence development. Experimentation is indeed an essential element of knowledge acquisition process of organizational learning and a way to develop organizational adaptability to change (Huber, 1991). Experimentation, together with risk taking, describes organizational openness to new ideas and ability to act on them despite the uncertainty about their results. Environments that are tolerant towards experimentation and mistakes are particularly good at facilitating organizational learning through accumulated experiences (Alegre & Chiva, 2008).

In Arenas and Santiago certain visionary individuals from top management were also playing and important role in promoting digitalization-focused learning cultures. Previous

research says that the support of top management is especially crucial for creating the necessary infrastructure and setting up organizational culture that fosters organizational learning (Yeung et al., 2007). As said before, Calama top management was not prioritizing digitalization in the company strategy in the short term, thus, limiting their digitalization-related organizational learning.

Arenas and Santiago were promoting not only the culture of experimentation with digitalization, but also more agile development methods together with customers. Interaction with external environment is crucial for learning , as companies try to learn together with their changing environment (Alegre & Chiva, 2008). In this way the companies demonstrated their open-mindedness towards new ways of working and their ability to interact with external environment, for which they had to adjust their practices. New metrics, e.g. as customer engagement, needed to be used for the evaluation of the required investments into digitalization. New competence pool was needed to be able to create this new value for customers. In order to be able to better shape customer value, companies were required to exercise new more agile development approach towards digital offerings. While Calama was strengthening the competence pool with new software competences, generally traditional company culture was supressing introduction of new work practices. However, the new leadership was expected to change this.

On top of the courage to experiment, the ability to work in cross-functional teams was seen by the companies as one of the success factors for digitalization initiatives. As discusses earlier, digital ubiquity in every project was emphasized by Arenas and Santiago. In order to achieve this goal, project teams needed to include people who possessed very diverse knowledge and who often were coming from different departments. Having this cross-functional teams efficiently working together is critical for organizational learning, as in addition to extending the sources and variety of knowledge put into the projects, it should support systematic re-examination and restructuring of information to support further actions (Calantone et al., 2002). For Calama, intra-organizational knowledge sharing was limited by product-line based organizational structure, that, indeed could be an obstacle to establishing collective beliefs associated with distribution of learning about digitalization within the company (Calantone et al., 2002).

Learning orientation generally guides individual and collective learning that enables organizations to utilize their knowledge and experiences in order to establish and achieve desired goals (Ahmed & Wang, 2003). Therefore, when setting the goal of getting onboard with digitalization, it is critical for companies to ensure that they are enhancing their digitalization-

focused learning orientation as a way to facilitate needed organizational learning. Organizational learning, meanwhile, is seen as a result of appropriate use of organizational knowledge (Martínez-León & Martínez-García, 2011) and as a key towards competence development (Drejer, 2000) and successful digital innovation(Alegre & Chiva, 2008; Calantone et al., 2002; Jiménez-Jiménez & Sanz-Valle, 2011). Hence, having strong learning orientation towards digitalization, as demonstrated by Arenas and Santiago, can be seen as a key towards organizational learning related to digitalization and developing both technological and customer competences needed for successful digital innovation.

5.2 Customer presence in digitalization-related organizational learning

Previous research also outlines that learning orientation fosters market-oriented behaviors (McGuinness & Morgan, 2005) that help learning-oriented companies to develop superior knowledge about customer's evolving needs and appropriate responses to those. Sharing created customer knowledge facilitates coordinated effort from different departments in a company and allows to respond to any needs in a contextual manner (Battor & Battour, 2013). Arenas and Santiago, indeed, demonstrated more customer focus in their digitalization efforts that could be explained by their stronger learning orientation.

My findings suggest that there are three main elements that describe customer involvement into digitalization-relation organization learning. First, customer is the focal point of digitalization as many of the digitalization initiatives are linked to the data about equipment performance that is ultimately coming from the customers. Customer equipment data is, indeed, the starting point for the knowledge acquisition process of digitalization-related organizational learning and competence development. Second, the focus on delivering customer value with new digitally enhanced solutions is driving development decision making in the companies. Third, co-development of the solutions with customers becomes critical in shaping customer value. Strong learning orientation of Arenas and Santiago enabled certain practices that helped to make customers present in their digitalization initiatives. For example, shared vision across the organization on the digitalization was highly important to ensure that the company was able to get the access to and use the customer data. While remote monitoring capabilities needed to be installed in new equipment to support initial steps towards data access, the potential benefits of the data access were often seen not in the equipment sales but in services. Another manifestation of learning orientation was open-mindedness where agile development and

experimentation, while being new to the very traditional manufacturing industry, were essential to enable co-development with customer for shaping better customer value.

> *"We ourselves we observed that, these things that we were able to design, as in add-ons to the functionality of [the equipment] not only, could make a significant transformation in the equipment capabilities but also could transform the way they are being maintained. And the way we, can learn and understand how customers actually use [the equipment] on the field. And learn about these incidents that typically cause [the equipment] to break down and what can be done to prevent those. So we started adding, sensoring and monitoring capabilities as a more of a standard, in our equipment. Even though the customer wouldn't necessarily require them. So we moved away from offering it as an additional extra, into equipment as in standard that we provide."* - *Interviewee L, Santiago*

The findings of the research also show that "process-critical" customers of Arenas and Santiago were more eager to provide access to their data and participate in co-development of digitally enhanced solutions. Generally, showing customer value and commercializing it seemed also easier for this customer group as they were eager to pay for potential improvement in their processes. Thus, the virtuous cycle between the three aspects of customer presence in company digitalization, based on research findings, worked for "process-critical" customers of Arenas and Santiago, but did not necessarily work for "process-noncritical" customers of Santiago and Calama. The criticality of manufacturer's equipment in the customers' processes affected their involvement in digitalization initiatives of the companies.

> *" If the customer sees the benefit, then why not, typically. --. But of course there are customers that are not at all accepting that we would gather data, from any operations whatsoever. Then, what can we do. But it's easier when you have a good, value proposition what value actually the customer receives from this remote connectivity and data analytics and so on." – Interviewee E, Santiago*

> *"..when we talk about process-critical equipment, then it's easier to justify, quite many, let's say, monitoring systems or additional services that will make sure that, the uptime is increase or maximised. So, the customers of these process-critical equipment, they are, I would say, mostly and sometimes only interested in that the equipment is available when needed. -- That's why, in those cases, it's clear that if we can bring the, let's say, it can be new sensoring, it can be new service concept, it could be new services, that target to keeping the, equipment up and running, or, preventing it from failures or, making the failures more predictive, in a sense so that we are able to predict those, failures in advance."– Interviewee E, Santiago*

While previous research lacks understanding of whether there is a difference in a way different customer groups can support organizational learning, the role of customers in organizational innovation has been studied before (Christensen & Bower, 1996; Danneels, 2000; Slater & Narver, 1998a; Urban & Von Hippel, 1988; von Hippel, 1986). Working closely with customers, is seen as means to a firm's survival in turbulent markets and as a way to differentiate from competition through double-loop, generic, learning style (Chaston et al., 2000). Lead user innovation theory describes a strong role of a particular customer group – lead users - in

innovation activities of a firm (von Hippel, 1986). Lead users have strong present needs that are to become general in the marketplace in the future. They are also expected to benefit substantially by finding a solution to their strong current needs. Their capability to see future conditions and motivation for solving their present problems make lead users especially valuable to firms that are working on development of new products and services (Matthing et al., 2006; Urban & Von Hippel, 1988; von Hippel, 1986). "Process-critical" customers of Arenas and Santiago and their high interest in improving the uptime and efficiency of their process-critical equipment make them fair to be called "lead users".

The findings of the research show that the lead users in the case companies were playing an important role is organizational learning related to digitalization. The initial knowledge about digitalization for Arenas and Santiago was based on the experiences with their "process-critical" customers. According to the interviewees, Calama's customers, who were mostly "non-process" critical", were not yet showing interest in digitally enhanced solutions and were not in any way supporting digital experiences for Calama. Meanwhile, change in organizational knowledge based on accumulated experience leads to organizational learning (Argote & Miron-Spektor, 2011). Organizational learning, in its turn, facilitates a firm's innovation (Jiménez-Jiménez & Sanz-Valle, 2011). Thus, although the role of lead users is usually discussed in the context of market research and innovation, it can be also applicable in the context of organizational learning.

> *"We've had remote connections for more than ten years for our [process critical equipment].. We've been able to help the customers at the site, remotely. But these have been more or less like tailor-made connections. Every time when a new equipment was, shipped to them then there was, this connection was built and it was not productised in a nice way. So there was the connection but you had to always go there and connect to that and do all these, unnecessary steps and things. But around 2007, there was this kind of a remote services programme or the vision was launched that, in 2010 we should have the capability to really provide our customers services based on these remote connections not just the single troubleshooting but, more like services on top of this."- Interviewee E, Santiago*

> *"When they had like 20 remote connections and then the guys were wondering, that happened quite a long time ago, actually, the guys were wondering that how about if we have some day 50, so we can't look it in an Excel anymore. We need to some other tool to handle this, that how about if we have one hundred some day. So, then it's not enough that we make a phone call to all the modems and collect the data that way, so there've been evaluations or like erasing how you have grown it, like today we have almost 9,000 connections. So, there's I would say nothing from the first solutions in what it's today. The basic idea, the data is flowing there somehow, but the technical solution is totally something else. Sometimes, it's in a way it's been right there since in the beginning, to you know start with the Excel and with the modems and making the phone calls, because then you can start to really evaluate the customer value for it." – Interviewee C, Santiago*

Previous research shows that a firm's competitiveness can be jeopardized in the context of radical technological change due to its excessive customer orientation and focus on the needs of its core customers (Christensen & Bower, 1996). The reason is that its innovativeness

becomes limited towards satisfying the needs of this core customer group. However, at the same time, strong impetus from customers can support acquiring new technological competences that firms need to combine with their customer competences for successful innovation (Christensen & Bower, 1996). Both Arenas and Santiago demonstrated the strong focus on customer needs, particularly on the needs of their lead users. They were driving the development of the companies' technological competences as the customer competences in regards to this customer group, meaning the ability to identify their needs and sell solutions that could fulfill them, were in place. At the same time, the two companies seemed to demonstrate ambidexterity in serving the needs of their lead customers with digitally enhanced solutions and looking for opportunities to serve the interests of their non-lead customers. In particular, for Santiago, the knowledge gained through experiences with their lead customers resulted in realization of the opportunities for applying the developed competences, particularly technological competences, to wider customer and equipment base. Nevertheless, while organizational competences developed with lead users could be applied to working with non-lead users, commercialization of those potential opportunities was still unclear.

> *"But when you really go into more demanding application areas where you go into process industry, or when you are getting more and more concerned about the uptime or the safety of the operation itself. --- And when you look at the top segment of the equipment, then that is something that can provide you with additional competitive advantage. In those application areas where customers are more concerned about the safety, or the high uptime of the equipment. Unfortunately, that's still only a small segment of the total amount of customers. If you look at the way our customers use the cranes and, still today a large portion of the customers use [the equipment] in a run to failure type of mode. --The capabilities that we have today in place can easily prevent, more than, even with the standard technologies that we have in place to today can easily prevent up to two thirds of those incidents. So, there is a significant potential in eliminating those safety related incidents or damage related incidents from the customer's process, if they would be interested enough, to address those topics. Unfortunately, this is only commonplace in those most demanding application areas. -- But those customers make only a small fraction of our total customer base. So all these things that we are able to create with the added sensory with the added, intelligence onto [the equipment], only address to a certain small segment of our customers. Then there's the wide segment of general manufacturing customers or customers that are using cranes in not so critical areas, where all the same benefits apply but the equipment itself is not that critical of a piece of equipment in the customer's process. So it makes it a bit more challenging to start than, selling the value of these additional features and functionalities to customers." - - Interviewee L, Santiago*

Lead user innovation theory leaves open the question whether needs of non-lead customers are going to be the same as those of lead users, thus, whether solutions developed together with lead-users will satisfy the needs of non-lead users (von Hippel, 1986). Lead user innovation seems to satisfy the needs of non-lead users only in the situations when both user groups have similar evaluative structures of a new concept. While the lead users of Santiago valued high uptime and efficiency, for their non-lead users these attributes, although being applicable, were not that critical. However, even though the same digitally enhanced solutions could not be offered to both customer groups, the competences originally developed with their

lead-users could then partly be utilized in creating solutions for their non-lead users. Therefore, while the main benefits of involving lead users are seen in market research (von Hippel, 1986), the findings suggest that the beneficial role of lead users can also be observed in organizational learning. The experiences with lead users helped the case companies to develop the knowledge needed for digitalization-related organizational learning.

5.3 Learning digitalization with customers

In the environment characterized by high pace of change working closely with customers is seen as means to a firm's survival and as a way to differentiate from competition (Chaston et al., 2000). In the context of digitalization, customers were seen by the manufacturing companies as an important source of digitalization-related knowledge. Meanwhile, organizational knowledge is the result of organizational learning processes (Martínez-León & Martínez-García, 2011). It means that customers, indeed, need to be a part of digitalization-related organizational learning processes.

On one side, customer presence in digitalization-related organizational learning can be defined by the company's learning orientation towards digitalization. Proactive learning about clients, competition and environment fosters market-oriented behaviors and can lead a learning organization towards higher levels of market orientation (McGuinness & Morgan, 2005; Santos-Vijande et al., 2005). Learning orientation helps organizations gain superior understanding of customer evolving needs and develop appropriate responses to them (Battor & Battour, 2013). On top of that, it supports continuity of customer relationships and closer customer relationships with customers (Battor & Battour, 2013; Raj & Srivastava, 2016). Higher level of learning orientation in Arenas and Santiago enabled the companies to put more focus on customer presence in their digitalization initiatives.

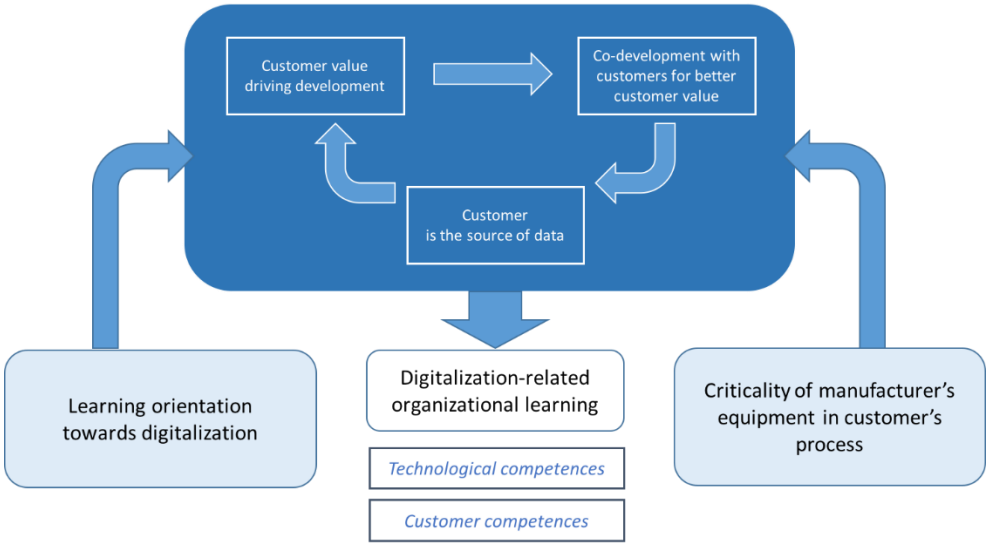

Figure 6. Illustration of learning digitalization with customers by manufacturing companies

On another side, customer presence in digitalization initiatives of a manufacturing company can be defined by the criticality of the manufacturer's equipment in their processes. Lead user innovation theory suggests that lead users - group of users with strong current needs about something that will become general in a market place and with strong potential benefits coming from fulfilling these needs – can be a valuable source of information for market research for novel products (Matthing et al., 2006; Slater & Narver, 1998a; von Hippel, 1986). My research suggests that they can also be a valuable source of knowledge in digitalization-related organizational learning and facilitate the development of required technological and customer competences. As defined by this research, the virtuous cycle of customer presence in digitalization worked for "process-critical" customers of Arenas and Santiago. They were also the ones who facilitated the initial information acquisition, interpretations and overall digital competence development for the two companies. Santiago was further applying the competences that they developed with their "process- critical" customers to expanding the digitally enhanced offerings to their "process-noncritical" customer segments and equipment. Calama was struggling with competence development due to lack of impetus from their customers, the majority of whom was "process-noncritical". Hence, my research shows that companies might be unequally positioned to undergo organizational learning and competence development needed for grasping the potential benefits of digitalization in terms of improved productivity, additional revenue streams and new customer value, due to the differences in the criticality of their equipment in customers' process. The discussed approach to learning digitalization with customers is summarized in Figure 6.

5.4 Practical implications

The practical implications of the research are threefold. First, it supports the notions that more research needs to be done on the role of customers in organizational learning. While customer orientation is generally accepted to have a positive impact on organizational innovation and learning orientation is also discussed as a facilitator for more market-oriented behaviors, there is a gap in understanding the role of customers in organizational learning. As the research shows, manufacturing companies might be not equally positioned to undergo the organizational learning needed for digital competence development, and, eventually, digital innovation, due to the differences in the criticality of their equipment in customer processes.

Second, manufacturing companies aiming to differentiate with the help of digitalization should put emphasis on developing learning orientation with the focus on digitalization. Learning orientation, manifested by shared vision regarding the role of digitalization in the company's strategy, commitment to learning about digitalization demonstrated by top management and supported by organizational culture, open-mindedness in regards to development methods and experimentation together with customers, and intra-organizational knowledge sharing throughout digitalization initiatives are essential to undergo digitalization-related organizational learning. Focus on digitalization needs to be present in all four dimensions of learning orientation in order to support competence development needed for digitalization and enable organizational behaviors that could enhance customer orientation in digitalization initiatives.

Third, taking actions for enhancing digitalization-related learning orientation in the manufacturing companies is, indeed, important to boost digital competence development, but it might be not enough. The learning orientation towards digitalization should be paired with the identification of and focus on lead customers who could navigate the digitalization of companies and enable the virtuous cycle of customer presence in its digitalization-related organizational learning. In the turbulent markets, working and learning closely with customers is seen as a way to survive and differentiate or a firm. Thus, customers who are eager to collaborate in development of digital solutions can become a critical source of innovation and competitive advantage for manufacturing companies in the context of digitalization.

6 Conclusions

In this chapter, I first provide a summary of the key findings in section 6.1. Further, I elaborate on the limitations of the conducted study, suggest potential areas for future research and provide some concluding remarks.

6.1 Summary of the key findings

The rapid changes in technologies will clearly leave no company immune to digitalization. Digitalization is expected to radically change the way companies operate and innovate. Despite the relatively easy accessibility of new technologies for many companies, they differ in their ability to transform and fully adopt the technologies, utilize the new information and, eventually, grasp the benefits brought up by digitalization. In the broader scope of this research, I was trying understanding the differences in manufacturing companies' ability to undergo digital transformation and particularly, their ability to develop digital competences. In the times when digitalization is gaining a stronger position on the companies' strategic agenda, digital competence development becomes strategically important for their future success. Previous research sees organizational learning theory as a key to understanding competence development.

While initial interviews with the case companies showed that customers were playing a role in digital competence development, the research shows that their presence in digitalization of the manufacturing companies was threefold. First, customer was the focal point of digitalization as many of the digitalization initiatives were linked to the data about equipment performance that was ultimately coming from the customer. Second, the focus on delivering customer value with new digital solutions was driving development decision making. Third, co-development of the solutions with customers was critical in shaping customer value. The research findings also show that the three aspects describing customer presence in company digitalization were interrelated, forming "a virtuous cycle of customer presence". For example, customers were ready to provide access to their equipment data if they could see a clear value based on the provided data. Alternatively, co-development with customer for better value proposition was often possible with good and trustworthy customers who are eager to provide access to their equipment data.

The findings of the research show that customer presence in manufacturing companies' organizational learning related to digitalization was influenced by their learning orientation towards digitalization and by the criticality of their equipment in customer operations. On one

side, learning orientation towards digitalization enabled organizational behaviors that emphasized customer presence in digitalization of the manufacturing companies. For example, shared vision across the organization on the digitalization was highly important to ensure that the companies were able to get access to and use the customer data. While remote monitoring capabilities needed to be installed in new equipment to support initial steps towards data access, the potential benefits of the data access were often seen not in the equipment sales but in services. Another manifestation of learning orientation was open-mindedness where agile development and experimentation, being new to a very traditional manufacturing industry, were essential to enable more iterative and interactive development with customer for shaping better value proposition.

On the other side, the virtuous cycle between the three aspects of customer presence in company digitalization, worked for "process-critical" customers with strong need for high uptime and efficiency. These customers were more eager to provide data access and be involved into collaboration for development. The criticality of the manufacturers' equipment in customer process made it easier to demonstrate potential value to them through improvements in the equipment's uptime or efficiency, that could have a considerable impact on their competitiveness. Meanwhile, the ability to demonstrate the value made it easier for the manufacturers to justify data access and remote monitoring capabilities for this customer group. Eventually, their involvement helped Arenas and Santiago to develop the competences needed for driving digitalization. However, Calama was clearly lagging behind in their organizational learning and digital competence development. This can be explained by low customer presence in their digitalization efforts due to lower criticality of their equipment.

Therefore, despite the efforts companies might be taking to enhance their learning orientation towards digitalization, the criticality of manufacturers' equipment in customer operations can unequally position them to undergo organizational learning and competence development related to digitalization. Considering critical role of organizational learning in strategic renewal and innovation of organizations, as discussed in previous research, the criticality of manufacturers' equipment in customer operations might also unequally position manufacturing companies to innovate with digital technologies and go through digital transformation.

6.2 Limitations of the research

This research provided some insight on digitalization-related organizational learning of manufacturing companies, on the role of customers in it, and on the factors that affect their involvement. The topic of the thesis was challenging due to the complexity digitalization phenomenon and the lack of digitalization-related research in the context of manufacturing industry in general, and from the perspective of how companies organize for and learn digitalization, and involve their customers into this process specifically. Despite a wide amount of discussion around digitalization on business press, it was difficult to find specific theoretical frameworks for digitalization-related organizational learning and customer role in it. For this reason, this study combined the theoretical perspectives on organizational learning and lead user innovation.

There are certain research limitations that should be carefully considered. First, the data was collected in only three case firms that were relatively large manufacturers with global business-to-business operations. The factors that facilitated learning orientation and the role of customers can be different for companies from other industries or of other scale of operations. Therefore, it is important to consider this context when drawing generalizations. Second, most of the interviews were held in English language which was native neither for the interviewees, nor for the interviewers. This might have affected the quality of the collected data as both the interviewers and interviewees needed some time to find the right words to express their ideas. Therefore, some meanings might have been misleading or misunderstood during the interviews.

Finally, due to abductive nature of the research, where the findings were formulated in iterative manner both inductively from the data and deductively from the literature, it is based on subjective evaluation of the relevancy and sufficiency of the data and literature by the researcher. Although richer data collection, more in-depth data analysis and more comprehensive literature review potentially could have yielded more insightful findings, I consider the overall quality of my research desirable for a Master's Thesis.

6.3 Future research

There are several potential areas for future research. First, since the data collection set was limited to three Finnish manufacturing companies, future research could investigate the applicability and generalizability of the findings to larger setting.

Second, as the findings of the research show that lead customers were playing an important role in generating required experience and knowledge, and facilitating digitalization-related organizational learning in manufacturing companies, future research could try to address the process of identification of such lead customers. One of the biggest challenges that companies face when involving customer into their product or service development efforts is identification of the customers with "innovative attitude"(Matthing et al., 2006, p. 289). The open question here is whether it is possible to appriori define the group of customers who will be not only the first ones to adopt the new digital services, but who will also be innovative enough to contribute to the development process with their ideas.

Third, future research could try to explore the applicability of organizational learning based on interaction with "process-critical" customers to "process-noncritical" customers in the context of digitalization. Lead user methodology, indeed, leaves open the question whether the needs of non-lead users in future will be the same as those of lead users. Therefore, understanding the extent to which the experience, knowledge and competences that come from collaborating with lead users are applicable to the rest of the customers is crucial for realizing the full benefits of digitalization.

And finally, future research could focus on investigating the peculiarities of digitalization-related organizational learning for companies with no lead customers. This study shows that manufacturing companies are not equally positioned to undergo the organizational learning needed for digital competence development, and, eventually, digital innovation, due to the differences in criticality of the manufacturer's equipment in customer processes. However, it is important to understand how learning could be organized by the companies that need to look for other ways to build their digital competences rather than by learning digitalization with their lead customers. Insights on that could potentially support understanding whether those companies would be able to not only learn digitalization but also benefit from it and innovate as well as provide a very valuable industry practice.

6.4 Concluding remarks

The new digitalization context puts more pressure on companies to learn new competences. While previous research was emphasizing the need to enhance learning orientation of companies to support their learning, my study suggests that this might not be enough. Learning orientation clearly supports organizational learning, and, on top of that, enables more customer-oriented behaviors. Nevertheless, the customer-oriented behaviors

generate organization learning only with the help of the lead customers. Therefore, it is highly important that companies combine promoting learning-oriented culture with identification of and collaboration with their lead customers in order to learn digitalization and get the right to play digitalization game.

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Appendix

Interview guide

- What kind of initiatives have you going on regarding digitalization, including both product and process-related use of IT?
  [For each initiative, ask briefly]:
  - When did the initiative start?
  - What is the main purpose of the initiative, in the sense that it is aiming for example mainly at the efficiency of internal operations, creation of customer value, or neither?
  - What was the motivation behind that?
- If possible, could you tell in your own words the story of the most important initiatives from their inception to the current state?
  - How were these initiatives started?
    - What was the deciding factor in the go/no-go decision?
    - How easily / or quickly has the decision been made (duration: from idea to decision)?
  - Have they been top-down or bottom-up?
  - What was the initial motivation behind them?
- Where did the idea come from?
  - From an external source or from someone in the company?
  - Do you follow what other players are doing in the same/some other industry

regarding digitalization?

- How is the initiative organized?
  - Separate unit?
  - Separate project?
  - Staffing / resources allocated?
  - Who's in charge? Is there a high-level sponsor for the initiative?
  - Could you elaborate on the roles of operating managers, the top management and the middle managers in between the two in these initiatives?
  - What has been the role of externals, such as the suppliers of the digital technologies, or consultants?
  - If you compare the current organization to the organization before the initiative, has something changed?
  - How are initiatives communicated / reported on throughout the organization?
  - What are the goals and specific targets for initiative?
    - Are there specific KPIs to track these targets?
- What has been your own role in the initiative?
- Have you identified some competences that are needed to make the initiative successful?
  - Do you have these competences?
  - How have you developed or acquired these competences?
  - If not, what are the obstacles in obtaining them?
- How are your customers reacting to these initiatives?
  - If the initiative is already visible to the customers, how have they reacted?
    - Is the reception positive, negative or neutral?

- How are the initiatives perceived inside the organization?
- What kind of challenges are there with these initiatives?
    - How are the challenges being managed?
    - What, in your opinion, has been essential for this initiative to be successful?
- Have there been any further ideas or proposals for digitalization initiatives which haven't proceeded to implementation?
    - What are the stories of these initiatives?
    - From where did these ideas originate?
    - Where did the initiatives stop? Why?
    - Who could tell us more about the digitalization initiatives that are on-going?
    - Who are the key people working on with them?
    - What about the scrapped initiatives?
- We often hear discussion about the Finnish companies being too technology oriented and not customer oriented enough. How do you see your corporate culture in this regard?
    - Do you have a strong customer orientation or efficiency orientation?
    - Can you share a story that many people at your company would know about somebody acting exceptionally well, according to the company values?
    - Could you tell, which professional group(s) in the company is/are generally considered as very distinguished, the ones that have the biggest role to play in the future success of the company?
    - How do the digitalization initiatives correspond to the company's overall customer orientation/efficiency orientation?
    - Do you have an internal goal to be more customer oriented?
        - Do you think the digitalization projects are helping or hindering that goal, or are they rather neutral?